THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LX. No. 1535.] LONDON, OCTOBER 11, 1892. [44TH YEAR. PRICE 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Guaranteed Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints" As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.

Special Quotations to Gas Companies.

TORBAY & DART PAINT Co., Ld.,
DARTMOUTH, DEVON,
EXPORT OFFICE, SUFFOLK HOUSE, E.C.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advt. p. III., centre of JOURNAL.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

INCLINED RETORTS,
FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.
Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

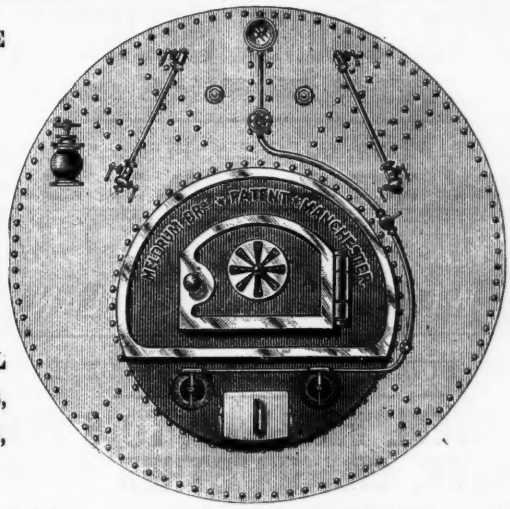
MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.
☞ Retort Setters sent to any part of the Kingdom.

DUST-FUEL FURNACE
(MELDRUM'S PATENT).

BURNS ANY KIND OF WASTE FUEL TO ADVANTAGE.

OVER 800 WORKING, SAVING, IN MANY CASES, 75 PER CENT.

SUPPLIED to the PRINCIPAL GAS-WORKS, WATER-WORKS, ELECTRIC LIGHT STATIONS, &c., &c.



LONDON OFFICE:
16, UNION COURT,
OLD BROAD STREET, E.C.
WILLIAM BOBY, Agent.
Telegrams: "MELDRUM LONDON."

NEWCASTLE-ON-TYNE:
CROSIER, MILLS, & CO.,
9, QUEEN STREET.

GLASGOW:
F. J. ROWAN,
121, WEST REGENT STREET.

MELDRUM BROS., ATLANTIC WORKS, 13, CITY ROAD, **MANCHESTER.**
Telegrams; "MELDRUM MANCHESTER." National Telephone No. 1674.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765),

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, LIMITED,

ENGINEERS & CONTRACTORS FOR GAS-WORKS.

TELEGRAPHIC ADDRESS: "COCKEYS FROME."

Improved Dry-Faced Centre Valves for Working either One, Two, Three, or Four Purifiers at one time; giving an increase of Purifying Area above that obtainable with ordinary Centre Valves of $33\frac{1}{3}$ per Cent.

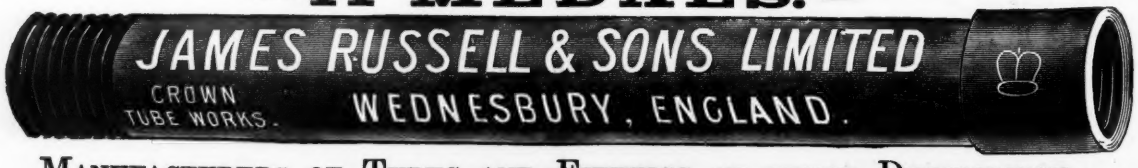
PRICES ON APPLICATION TO THE SOLE MAKERS.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

London Office: 77, Fore Street, E.C.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

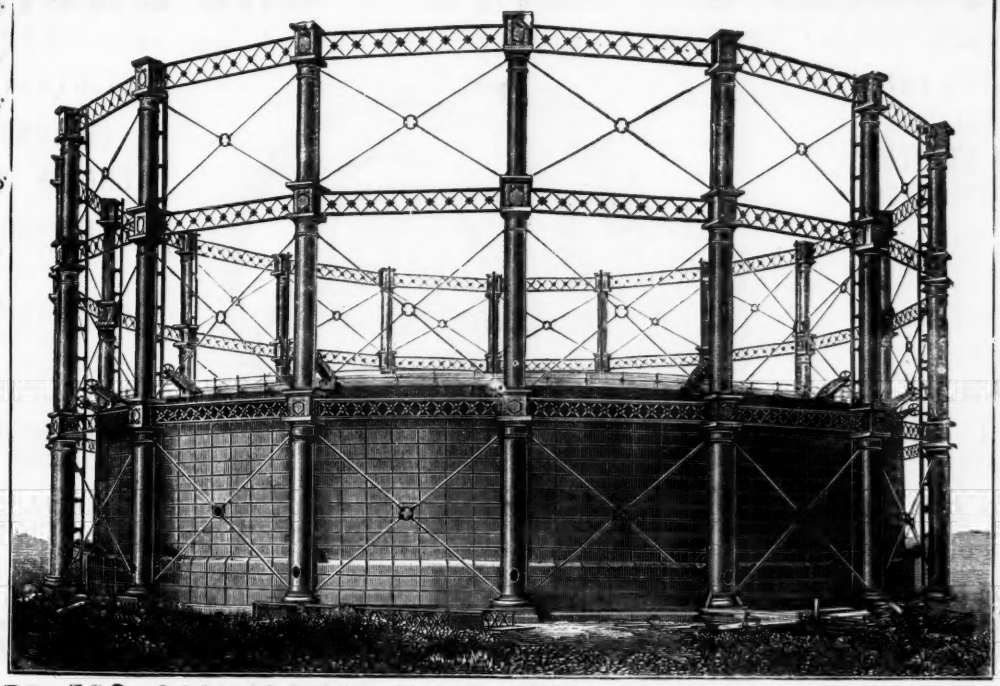
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street.
BIRMINGHAM: 114, Colmore Row.
LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT-LIDS, & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED.

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

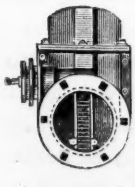
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

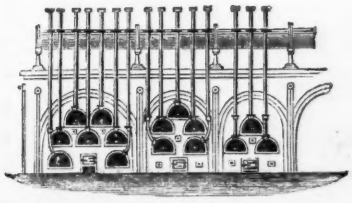
TAR AND LIQUOR PUMPS, &c.

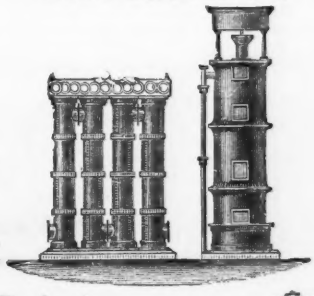
PATENT CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.





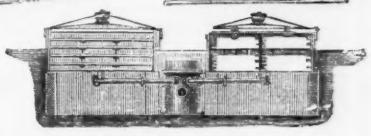


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

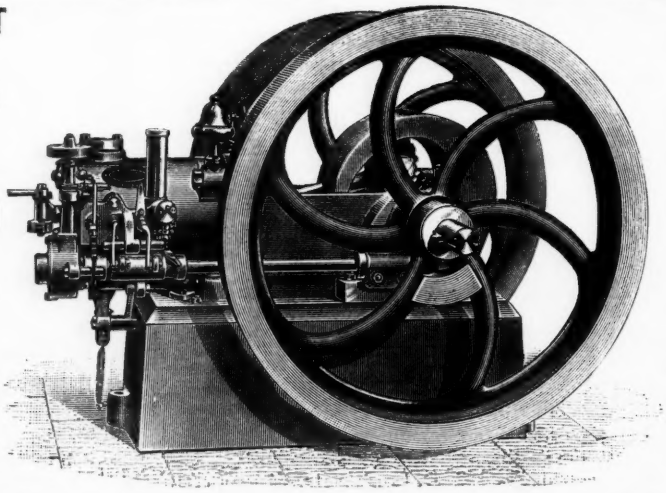
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

CRYSTAL PALACE EXHIBITION, "DIPLOMA OF HONOUR"—Highest Award to Gas-Engines.

CROSSLEY'S PATENT OIL-ENGINES, PATENT STARTERS PATENT TUBES FOR IGNITION, PATENT PENDULUM GOVERNORS, PATENT SAFETY HANDLES, PATENT TIMERS PATENT ANTI-FLUCTUATING GAS-BAGS.



PATENT CATARACT GOVERNORS, CHANGE SPEED GOVERNORS.

Every Engine thoroughly tested before being sent out.

ALL PARTS MADE STRICTLY TO GAUGE.

OVER 800 ENGINES ALWAYS IN HAND.

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

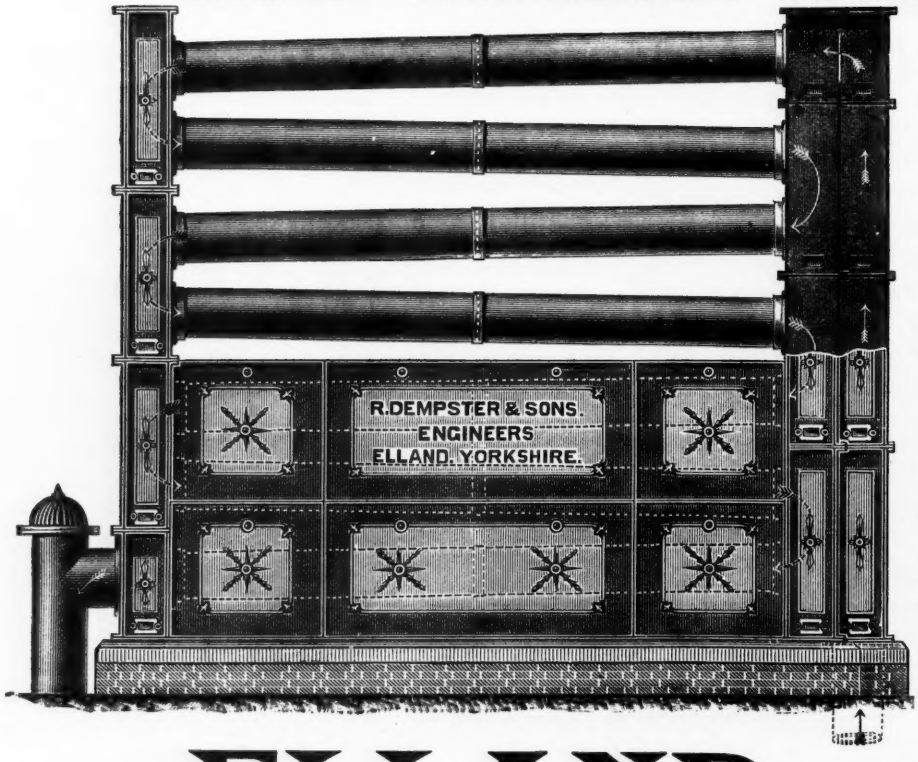
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

ROBT. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

IMPROVED HYDRO-PNEUMATIC CONDENSER.



With this Condenser the Gas is cooled in a most regular and gradual manner, and forms one of the most powerful and efficient means of Condensing. The facility offered for Controlling its effectiveness according to the quantity of Gas made or the Temperature of the Atmosphere, will commend itself to all Engineers and Managers. By means of Counterbalanced Wing Valves, any series of Tubes may be thrown out of action, the Water-Tank easily emptied or filled as desired, and the flow of cold Water through the Tank regulated at will.

ELLAND, YORKS.

R. LAIDLAW & SON.

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH 1886.

MAKERS IN EDINBURGH OF

STATION METERS, ALL SIZES,
GOVERNORS,
PRESSURE REGISTERS
(To Indicate New Time),
PRESSURE GAUGES,
TEST GASHOLDERS,
TEST METERS,
SIEMENS' WATER-METER,
ALL KINDS OF GAS APPARATUS & FITTINGS.

MAKERS IN GLASGOW OF

CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
WROUGHT-IRON TUBES AND FITTINGS,
BEAMS, COLUMNS, TANKS, &c.

Wet and Dry Meters of every description repaired, altered, and adjusted, at prices which we shall be pleased to furnish on application.

A LARGE STOCK OF METERS ALWAYS READY FOR IMMEDIATE DELIVERY OR SHIPMENT.

Descriptive Price Lists, Estimates, & full particulars forwarded on application.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

KIRKHAM, HULETT, & CHANDLER,

LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

PATENT

"STANDARD" WASHER-SCRUBBER.

455

of these Machines erected and in course of construction. These facts are given as evidence of the apparatus being the most efficient of any in the market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

69 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to 41 original pattern Machines.

TESTIMONIALS.

The Gaslight and Coke Company,
Horseferry Road, Westminster, S.W.,
Nov. 25, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LTD.,

Gentlemen,

In reply to your inquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. TREWBY.

NOTE.—Orders since received for two 3,000,000 cubic feet per day Machines for Kensal Green; and two 3,500,000 cubic feet for Beckton, &c., &c.

Extract from the JOURNAL OF GAS LIGHTING, &c., for Sept. 27, 1892, referring to the visit of the Members of the Eastern Counties Gas Managers' Association to the Lowestoft Gas-Works—

"Mr. J. Ayris has one of Messrs. Kirkham, Hulett, and Chandler's "Standard" Washer-Scrubbers in operation (capable of dealing with 500,000 cubic feet of gas per 24 hours); and of the working of this machine he spoke very highly."

Estimates furnished for cost of altering original pattern Patent "Standard" Washer-Scrubbers, or for the supply of New Machines.

ADDRESS:—

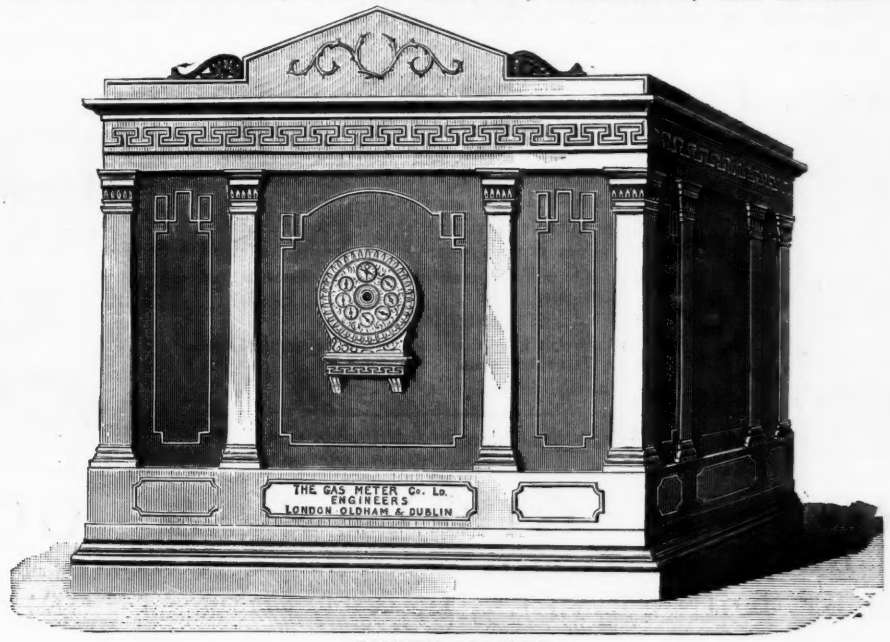
3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

THE GAS-METER COMPANY,

MANUFACTURERS OF LIMITED.

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.



STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON, Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238 KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

THE

CAMPBELL GAS-ENGINE.

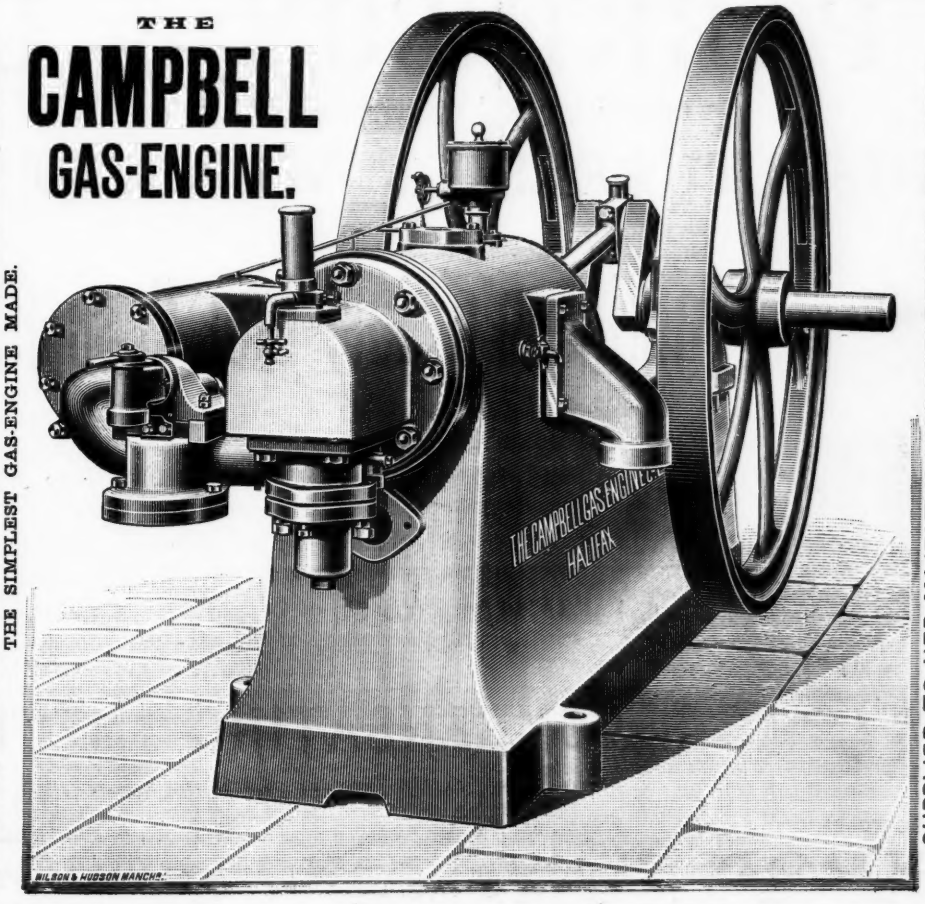
SOLE MAKERS:

THE CAMPBELL GAS-ENGINE COMPANY, LTD.,

HALIFAX, ENGLAND.

LONDON: 114, TOOLEY ST. GLASGOW: 99, BOTHWELL ST. BIRMINGHAM: 103, SNOW HILL

THE SIMPLEST GAS-ENGINE MADE.



SUPPLIED TO HER MAJESTY'S WAR DEPARTMENT AND MANY GAS-WORKS.

GAS CONSUMPTION AND POWER DEVELOPED GUARANTEED.

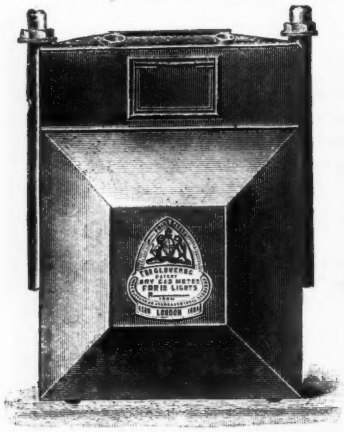
PATENT STARTERS. PATENT GOVERNORS.

THE SECOND LARGEST GAS-ENGINE MAKERS IN THE KINGDOM.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

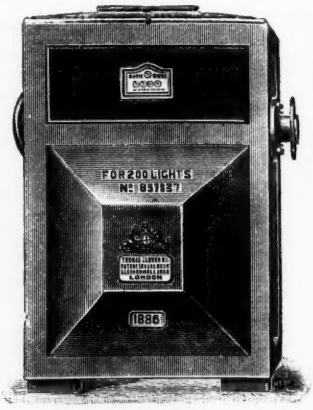
LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.



Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address*: "GOTHIC."

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address*: "GOTHIC."

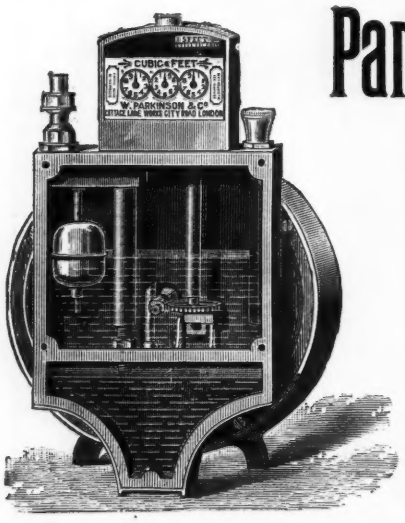
LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address*: "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address*: "GOTHIC."

W. PARKINSON & CO.

ESTABLISHED 1816.

MANUFACTURERS OF WET METERS.



Parkinson's Cast-Iron Case Meter.

Works with very little friction.

Will stand very high pressures.

Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.

Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.

Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

COTTAGE LANE WORKS, CITY ROAD, **LONDON.** Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE, **MANCHESTER.** Telegraphic Address: "PRECISION."

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Condition of the Commercial Gas Company . . . 629
Meeting of the Incorporated Institution of Gas Engineers . . . 630
On a Certain Controversy . . . 630
Trades Unionism in Theory and Practice . . . 630
Tin-Plates in the United States . . . 631

WATER AND SANITARY AFFAIRS—

Resumption of the Proceedings of he Metropolitan Water Commission—An Important Statement by the Chairman as to the Publication of Sir G. Buchanan's Evidence; The Engineering Evidence . . . 631
The Meeting of the East London Water Company . . . 632

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 632
Electric Lighting Memoranda . . . 632
The Incorporated Institution of Gas Engineers at Birmingham and Coventry . . . 633

NOTES:—

The Colour of Incandescent Metallic Vapours . . . 635
The Roberts-Austen Recording Pyrometer . . . 635
Sulphate of Ammonia in France . . . 635
Elephant Boilers . . . 635

TECHNICAL RECORD:—

North of England Gas Managers' Association—The Half-Yearly Meeting at Seaham Harbour—Discussion on Mr. Tobey's Paper on Asphalte Paving 636
Otto's Patent Aerial Ropeways . . . 638

REGISTER OF PATENTS:—

Gas Chandeliers—Austin, C. D. . . . 639
Gas Engines—Clerk, D. . . . 639
Gas Fires or Stoves—Bird, S. V., and Wood, J. S. . . . 639
Gas Motor Engines—Lee, R. A. . . . 639
Patent Notices . . . 639

CORRESPONDENCE:—

Anthracene . . . 640
Mr. Gadd's Mechanics . . . 640
Regenerative *v.* Ordinary Settings . . . 640
The Use of Coal Tar in Carbonization . . . 640

LEGAL INTELLIGENCE:—

Highgate Petty Sessions—Finchley Local Board *v.* Barnet District Gas and Water Company; The Provision of Water for Street and Sewer Cleansing and Fire Extinction . . . 641

MISCELLANEOUS:—

Meeting of the Commercial Gas Company . . . 642
Meeting of the Alliance and Dublin Consumers Gas Company . . . 643
Meeting of the San Paulo Gas Company, Limited . . . 643
Birmingham Corporation Gas Supply—The Gas Committee's Report; The Price of Gas and the Coal Contracts . . . 644
The Extensions at the Stafford Corporation Gas-Works—A Municipal Visit to the Works . . . 644
The Smoke Nuisance at the Coventry Corporation Gas-Works . . . 645
The Price of Gas at Preston . . . 645
The Metropolitan Water Supply Commission—Seventeenth Day . . . 646
Meeting of the East London Water-Works Company . . . 649
The Leicester Corporation Water-Works . . . 650
Notes from Scotland . . . 650
Current Sales of Gas Products . . . 651
Coal Trade Reports . . . 651
Gas and Water Companies' Stock and Share List . . . 653

PARAGRAPHS.—"Domestic Electric Lighting," 631—A Donation to the Royal Institution, 631—The New Croton Dam of the New York Water-Works, 633—Sinking a Flexible Water-Main, 634—Mr. Alderman Avery, 635—Messrs. Richmond and Co.'s Improved Gas-Fires, 635—American Gaslight Association, 635—A Deep Artesian Well, 635—The Cleansing and Ventilation of Pipe Sewers, 637—Society of Engineers, 638—Abolition of the Réaumur Scale in Germany, 638—"A Substitute for the Sun," 638—The Expiration of the Lowe Patent, 638—Reduction in the Price of Gas at Keswick, 640—The Wigan Gas Committee and the Electric Light, 640—The Cost of Electric Light, 641—Electric Lighting for Maidstone, 641—Kimberley Water-Works Company, Limited, 643—Electric Lighting for Accrington, 648—Stoking Machinery and the Hours of Labour at the Keighley Gas-Works, 648—The Assessment of the Lancaster Corporation Gas and Water Works, 648—The Borrowing Powers of the Manchester Gas Department, 648—The Quality of the Water Supply of Rotherham, 648—New Water-Works for Bodmin, 650—Poisoned by an Escape of Gas, 650—Extensions at the Rochdale Gas-Works, 651—Sales of Shares, 652—Suggested Transfer of Gas-Works to the Barnoldswick Local Board, 652—Electric Lighting for Blackpool, 652—New Joint-Stock Companies, 652—Electric Lighting for Middlesbrough, 652 The Carlisle Gas and Water Undertaking, 652—Bombay Gas Company, 652—Electric Lighting in South Africa, 652—New Gas-Works for Stockton, 652—The Ilkley Local Board and the Gas-Works, 652—Failure of the Electric Light in Dublin, 652—The Public Lighting of Honiton, 652—The Leeds Corporation Gas Coal Contracts, 653—The Water Question at Gloucester, 653—Dorking Gas Company, 653—The Water Question at Chester, 653.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 11, 1892.

The Condition of the Commercial Gas Company.

To say of the meeting of the Commercial Gas Company which was held last Friday—Mr. J. Blacket Gill in the chair—that it passed off tamely, would be to utter a mere commonplace. There are gas-works administrators who unreservedly subscribe to the sentiment, in so far as it can be applied to their case, that the happiness of a people consists in having no history; and the Commercial Directors are of this class. They reduce their half-yearly reports to the baldest summary of the accompanying accounts; and they would doubtless be pleased if the formality of a general meeting could be dispensed with, and the interest of the proprietors in their doings restricted to the receipt of the dividend warrants. It so happens, however, that, in theory at least, London gas directors have to submit twice every year to the process which in their case may be described in a very literal sense as "hauling "over the coals." They must come before the tribunal of a public meeting, and show what they have done for their fees. And behind the assemblage of shareholders stand the watching public and the governing authorities, taking note of how they discharge their responsibilities. In practice, the control upon directors which general meetings of proprietors are supposed to exercise is a fiction so long as matters go fairly well. The ordinary meetings of prosperous companies are the dullest of all "functions" while dividends are good and there is no question respecting the safety of the capital. So good a guarantee is given by statute of the stability of gas property, that this dulness is an inevitable concomitant of all Metropolitan Gas Companies' meetings. But, unfortunately, the repose of shareholders is apt to induce somnolence in directors, who are too liable to forget, in the shelter of their Acts, the fact that gas supply is, after all, a business, and that those entrusted with the management of it must submit to be judged according to commercial standards. Once more it appears to be necessary to insist upon the truth that the statutory protection of gas undertakings in this country is not intended to shield gas companies from the effects of incapacity at head-quarters, but only to permit of their developing their usefulness to the community without interference by superfluous competitors. Twice in the course of their history have the London Gas Companies been forcibly shaken up from the lethargy into which they had fallen through misunderstanding their position. Mr. Croll gave them the first shock, and did the gas interest as well as the public of his time a world of good, by bringing directors to a sense of their commercial obligations. After his day, however, matters settled down quietly once more; and then came the sliding scale, which changed the face of the Metropolitan gas industry. Is it time for another awakening? It appears so, if one may judge from the present condition of the Commercial Gas Company. The Directors of this Company distinguished themselves seventeen years ago by the foresight with which they met the sliding-scale movement; but they have been going quieter and sleepier every year since that memorable crisis.

It is not pleasant to take up the burden of the responsibility for disturbing, in apparent wantonness, such repose as that to which the Directors of the Commercial Gas Company would evidently desire to be left. It is necessary, however, that the truth should be spoken in the general interest, even though it be to the discomfort of certain worthy and estimable gentlemen who would infinitely prefer to be allowed to go on their own way, whatever the price of gas or the prospects of shareholders. The aspect of affairs revealed by the Commercial accounts is incontestably bad; and the circumstance that mutterings respecting the cost of management were heard at Friday's meeting is good evidence that the assumption of the Chairman that the administration of the Company's affairs is altogether admirable, is not shared by the whole of the proprietors. It is all very nice to pass votes of thanks to Directors and staff; but the "mutual admiration" performances that usually bring general meetings to a conclusion cannot conceal facts. And there are several facts in connection with the actual state of the Commercial Company which the best man of business on the Board, whoever he may be, would be well advised in considering. The Company have had to put up their price again, and so yield to the South Metropolitan Company the precedence of selling the cheapest gas in London. It is right and proper to lament over this decline, as Mr. H. E. Jones did frankly enough on Friday; but is it certain that everything is done that should be done to make gas at the lowest cost? For instance, take the fuel account. How does this compare with that of other companies? Is it correct that the Company have done nothing whatever in the direction of gas-generator firing, which every other undertaking of respectability has long ago adopted? Then, again, according to the last accounts, the Commercial carbonizing wages are the highest in London. How much stoking machinery have they at work? Mr. Jones told the Commercial shareholders that the state was worse

than that of any other Gas Company with which he is connected. It was not a judicious observation, since it may well have suggested to any discontented shareholder a reflection which we will not wound Mr. Jones's feelings by expressing here. These, however, are not times for regarding of persons; and when returns are not good, people will look everywhere for the reason why.

It is deplorable, moreover, that the Chairman had to explain to his constituents how, owing to the unfortunate coincidence of a dispute with the Company's coalies and the strike of colliers in the North of England, the Company were caught with a low stock of coal. There are too many of these apologies for misunderstandings between the Commercial Company and their labourers, although, if lavish expenditure could purchase peace, there would be no labour troubles at Stepney, Poplar, or Wapping. On the whole, the poor appearance made by the accounts was not relieved by anything that transpired on Friday; and it must be conceded that Mr. Gill, who is a good, but not a cheerful speaker, had ample reason for the dismal tone of his references to the recent experience of the Company. Let us hope, however, that things will mend with them by this time six months.

Meeting of the Incorporated Institution of Gas Engineers.

THE Incorporated Institution of Gas Engineers held last Tuesday the informal autumn meeting to which reference was made in the JOURNAL for the 27th ult. Mr. Hunt's invitation was accepted by a numerous company, who had every reason to be satisfied with the arrangements made for their entertainment at Birmingham and Coventry. The programme was admirably suited to the occasion; and it was carried out with most businesslike exactitude. It must henceforward be the study of future Presidents of the Institution to find similarly convenient and instructive meeting-places for the autumn gatherings which have been so well started by Mr. Hunt; and our faith in the utility of such assemblies is only dashed by doubt as to the prospect of the Institution being able to find the desirable variety and number of centres of interest. It is an error to meet troubles half way, however; and we shall therefore rest content for the present with placing upon record the success of Mr. Hunt's experiment, and expressing the hope that it may be equalled, if it cannot be surpassed, by future leaders of the Institution. It has often been argued by us that the reading and discussion of papers should not be regarded as the chief work of a technical society. Indeed, such opportunities for the inspection of works and processes new and old as were afforded to members of the Institution last Tuesday, are far more instructive than the vast proportion of "papers" can ever be; because works are solid facts, whereas papers may be only devices for boring the many by the foolishness of one. Mr. Hunt is essentially a man who is "in the "movement" of his time; and of Mr. Winstanley, of Coventry, it may also be remarked that he is not one to willingly lag behind the march of his contemporaries. In undertaking to show such a body as the members of the Institution of Gas Engineers over their works—not merely as a matter of courtesy, as between a professional man and his friends, but for the purpose of exhibiting a particular experimental system of working, respecting the advantages of which sharp differences of opinion exist—Mr. Hunt and Mr. Winstanley did a bold thing for the sake of the Institution. It would have been open to either Engineer to have protested that his works were not fit for inspection —that he wished to be quite satisfied with the results of his novel carbonizing experiments before permitting professional critics to see what he was doing. But the hosts of the Institution last week did differently; and the best thanks of this body are due to them for their public spirit, as well as for their hospitality. We shall certainly not spoil the occasion by hanging upon it a disquisition upon the claims of inclined retorts to the patronage of gas makers. It was not the retort-settings at Birmingham or Coventry which were on trial last week, but the Institution of Gas Engineers; and it is in this light that we prefer to regard the occasion. It is with great pleasure, therefore, that we are able to state that the blunder of last year was amply repaired on Tuesday and Wednesday, thanks mainly to Mr. Hunt, whose unostentatious kindness to every one of his visitors completed the tale of the services he has rendered to the Institution since its foundation. Before quitting the subject, it should be mentioned that the sole reason why neither Alderman Pollack, the Chairman, nor any other member of the Birmingham Corporation Gas Committee was present to welcome the Institution to the city, as Mr. Andrews did later for the Corporation of Coventry, was because of the meeting of the City Council on that day, as reported in another column.

On a Certain Controversy.

IT is greatly to be desired that the discussion respecting the value of gas-works residuals which has been going on during the past few weeks in our "Correspondence" columns will have some tangible result beneficial to the gas industry. There is a class of epistolary communications which editors of technical journals like this are glad to receive and to commend to their readers' notice; just as there are others which strain the editorial complaisance to its utmost limit of elasticity. The correspondence on the subject of anthracene belongs to the former class; and it would not be necessary to go far in order to find a highly developed specimen of the latter. If there is one element in the matter that comes into an editor's letter-box which deserves the "bad pre-eminence" of being ranked as the most profitless of its kind, it is the personalities to which some pertinacious correspondents are prone. Some controversies are personal in their essence and purport, as when one man essays to pose as an authority upon a scientific or a technical subject, only to arouse in somebody else the desire to show his claim in this regard to be unfounded. Much as one may desire to quell these disputes, or at least to keep them within reasonable limits of space, it is usually exceedingly difficult to do so. Each party will insist upon having the last word, oblivious of the fact that the observing public which stands by and says nothing does not need reiterated assertion and denial to help the formation of an impartial opinion as to which side right and reason incline. Some journals revel in personal disputes; but we have too many calls upon our space to permit of our encouraging this variety of controversy, even if it were as desirable a class of matter as it is the opposite. The personal element is only too apt to appear in arguments about apparently impersonal things. Sometimes it is enough that a particular person advocates a certain line of conduct or course of action to inspire some others with incurable suspicion of a violent antipathy to it. There is, however, one satisfactory result of the existing depression in the gas-works residuals trade—it is so serious that none of the petty jealousies and private animosities that complicate business relationships in the little world of the gas industry, as they do in every other section of the great commercial universe, can be esteemed serious enough to prevent any kind of united action that shall commend itself to the common sense of the majority. Surely, if there has been blundering anywhere, now is the time to correct it; if there has been wrongheadedness in any quarter, the opportunity for reviving the sway of sound judgment has arrived. Whoever would pursue a private quarrel in face of the common enemy, or would cling to an old error of tactics which can be demonstrated a source of weakness to the side that practises it, would incur a considerable amount of odium.

Trades Unionism in Theory and Practice.

IT may seem at first sight more than a little strange that we should mention in these columns the recent Church Congress at Folkestone. Our readers need not be alarmed on this score, however; since we do not refer thereto with a view to discussing theological matters, but only for the purpose of commenting upon the way in which the subject of Labour Combinations came before the assembled clergymen and their associates. At an evening sitting of the congress, Alderman H. Phillips read a paper glorifying Trades Unions and their aims as being everything that is good and worthy. The author of the paper, who had something to do with the dockers' strike of 1889, and therefore poses as an authority upon the whole subject of Trades Unionism, seems to have carried the Congress with him in his fancy description of what Trades Unions ought to be and to do, which, it is hardly necessary to remark, carefully omitted all reference to what these organizations really are, and how they actually work. Alderman Phillips skipped over the Burns blunders and the Leeds brickbats as easily as if his audience was not to be credited with the habit of reading the daily newspapers; but even his

audacity was surpassed by that of Canon Scott-Holland, who bluntly advised the clergy to play for popularity by siding with unionists "on principle," regardless of the blunders their leaders might commit or the injustice of their deeds. After this, it was like a breath of cool air through an over-heated revival meeting to hear Lord Brassey warning the clergy against meddling with matters which they do not understand, and taking sides with any section or class of the community. "Trades Unionism," said Lord Brassey, "when led by inexperienced men, may "be rash and aggressive." It may be worse, as a London newspaper has lately shown in a series of articles exposing the Seamen's and Firemen's Union and its General Secretary, Mr. J. H. Wilson, M.P. These articles, which appeared in *The Morning* on the 3rd, 4th, and 5th inst., purport to show how "Poor Jack's" money is wasted, principally upon Mr. Wilson himself. It is there stated that Mr. Wilson's election expenses, the costs of the "demon-"strations" in his honour which were made so much of when he had "done his bit of time" for intimidation of non-unionists at Cardiff—the cost of everything, in short, which has contributed so largely to build up Mr. Wilson's notoriety, has been taken from the money of poor Mercantile Jack. It would be curious to know whether enthusiasts like Canon Scott-Holland would endorse all these vagaries of practical Trades Unionism.

Tin-Plates in the United States.

Some time ago we mooted the question as to how the gas-meter trade of the United States has been affected by the M'Kinley tariff, which was specially framed to create a tin-plate manufacture in the United States. Not a word upon the matter has appeared in any American technical journal; and from this circumstance we conclude that the cost of meters is too insignificant a point of American gas-works administration to talk about. There is a good deal of fascination about this subject of the United States trade in tin-plates, to all who desire to know something definite about the workings of a protective tariff. Even here in England—as occasional letters in the newspapers remind us—there are people who hanker after the protection of this or that commodity of home production, by means of a duty upon the imported article. Their idea in regard to this matter is that the foreign producer would pay the duty, and to that extent suffer for his intrusion into the home market; whereas the truth is the exact contrary—the duty being really paid by the home consumer. How this comes to pass is shown clearly enough in respect of the American tin-plate trade. Before the M'Kinley tariff was imposed, practically no tin-plate was made in the States. The United States Government thought the manufacture ought to be established; and accordingly they imposed what was intended to be an almost prohibitory duty upon the Welsh goods. It now appears, however, that, so far as the experiment has yet gone, it has not had the desired effect. Only with the greatest difficulty do the native manufacturers get their productions upon the market, notwithstanding the help they receive from the Customs officials, who seem to construe the term "American-made tin-plates" with extreme elasticity. Meanwhile, as much tin-plate as ever is being imported into the States. It is said that, for the year ending June 30 last, the quantity of tin-plates imported and taken into consumption in the States was upwards of 380 million pounds weight. Every pound of this paid a duty of 2·2c.; so that the American nation last year paid the nice little sum of £1,700,000 in order that manufacturers might be able to try the experiment of making tin-plates, which they did to the extent of one fifty-fifth share of the normal home consumption. It is not for outsiders to complain if the great American nation likes to make "ducks and "drakes" of the money of the people in this way; but the performance appears to be far more costly than amusing or satisfactory in any respect.

"Domestic Electric Lighting."—A work under this title, dealing with the subject from the consumer's standpoint, will very shortly be issued by Messrs. H. Alabaster, Gatehouse, and Co. The author is Mr. E. C. De Segundo, Assoc.M.Inst.C.E.

A Donation to the Royal Institution.—The Treasurer of the Royal Institution (Sir J. Crichton-Browne) has received from Mr. T. Hodgkins, of Long Island, New York, the munificent donation of £20,000 to the funds of the Institution, to be applied in the promotion of scientific research.

WATER AND SANITARY AFFAIRS.

In accordance with the arrangement to which we referred last week, the Royal Commissioners charged with the investigation of the question of the Metropolitan Water Supply resumed their public proceedings on Wednesday last, taking evidence on that and the two following days. On Thursday the Chairman—Lord Balfour of Burleigh—called attention to a subject on which we offered some comments a fortnight ago. A statement had then appeared in the *British Medical Journal*, that Sir George Buchanan had been giving "some very interesting evidence" before the Royal Commission, which evidence—by some means or other not specified—the journal in question was "enabled" to lay before its readers. An abridgment of that which appeared in the *British Medical Journal* was published, with acknowledgment, in the *Standard*, accompanied by the announcement that the original report was a *précis*, and that the evidence was given before the Commission "at a special sitting." Although we had made due arrangements for an independent report of all the public proceedings of the Commissioners, we had received no intimation of this "special sitting," or that Sir George Buchanan had been heard as a witness, until the report and its duplicate appeared in the papers we have named. While perfectly exonerating the Royal Commissioners, we at the same time expressed an opinion that the evidence of so important a witness as the late Principal Medical Officer of the Local Government Board should have been left to the custody of the Commission, or should have been given at a meeting open to the usual representatives of the Press. We are glad to find that the kind of protest which we felt it our duty to offer, receives substantial support from the announcement just made by Lord Balfour. His Lordship states that whereas an interview had taken place between the Commissioners and Sir G. Buchanan, the document which was represented as being the notes of that interview was "in an incomplete and incorrect "form, and was not made public with the consent of the "Commissioners." While they had thus taken counsel with Sir G. Buchanan, they had not thought of making the interview public "until the time of their report." Now that an "incorrect report" has been put about, and some "very "incorrect inferences" have been drawn from what has appeared, the Commissioners have determined to issue "an authentic account" of the interview. This is the best course that can be taken under the circumstances; and the Commissioners deserve credit for their determination. Unfortunately, mischief has been done, and we can only regret that an "interview" at which elaborate and prolonged statements were presented, was not made subject at once to the same publicity as the other proceedings at which evidence was received.

The witnesses giving evidence before the Royal Commissioners last week were all members of the engineering profession, though in some cases there was a divergence to chemical and biological considerations, as well as to those of a geological character. Mr. John Hopkinson, who appeared on behalf of the County Council of Hertfordshire, and gave evidence as to the rainfall, travelled into the region of the microbes; saying that if the germs were so small that they could not be detected by the microscope, he did not think they could be removed by filtration. Being a naturalist as well as an engineer, we should have expected to find Mr. Hopkinson a little better posted up in this part of the subject. As it was, he pleaded ignorance of the facts brought to light by Dr. Koch's process, and reported upon by Dr. Frankland, showing the enormous extent to which the microbes or their germs, existing in the river are reduced in the supply; being arrested by the filter-beds of the Water Companies. Mr. Thomas Hawksley laid a mass of evidence before the Commissioners as to the large amount of water which the Companies would be able to command by means of storeage reservoirs and otherwise, and likewise discussed the question of cholera germs at considerable length; contending against the exaggerated views which are sometimes promulgated as to the pollution of the supply. He said he had no fear that London would suffer from the microbes. Sir F. Bramwell's evidence was directed in a great measure to the proper amount of water per head of the population, and the necessity for checking waste. He

was satisfied that the quantity of water sent into London was in excess of its real requirements. Mr. Baldwin Latham expressed his conviction that the Thames, the Lea, and the chalk formation round London, would be found to yield an abundance of good and wholesome water, practically sufficient to serve London and its neighbourhood for a century to come. He reckoned on about 275 million gallons for a population of 8¾ millions forty years hence. With respect to the effect of pumping in lowering the level of the underground water, Mr. Latham stated that he found there was no great fall in the wells outside the neighbourhood of the pumping—in fact, the level was higher in the wells now than it was in some previous years, such as 1864 and 1865. Mr. Binnie, on behalf of the London County Council, offered a counter-statement which rather surprised Lord Balfour, as signified by his Lordship's question: "Do you wish us to understand that in "the chalk under London the level of saturation is 52 feet "lower now than it was in 1840?" Mr. Binnie replied: "Certainly, and in some places more." At this rate we might almost expect London itself to subside, or at all events to show some degree of settlement here and there. Perhaps the geologists will throw further light on this question next week. Professor Robinson's proposal to construct one huge storeage reservoir in the Kennet Valley was apparently improved upon by the scheme of nine separate reservoirs, devised by Mr. Henry Marten, in conjunction with Dr. Henry Woodward, Mr. Horace Woodward, Mr. Topley, and Professor Boyd-Dawkins. The total cost was estimated at nearly £2,000,000. Mr. Marten, who is the engineering adviser to the Board of Agriculture, and has been engaged by the Thames Conservators to investigate the resources of the Thames basin, reckoned on an adequate supply being furnished for a period of nearly half a century. His evidence strikes us as being among the most important which has been laid before the Commission.

Mr. George Banbury, though unexpectedly called upon to preside at the half-yearly meeting of the East London Water Company, held last Tuesday, offered an able and interesting address. Success continues to accompany the undertaking. The works are being extended, improved engines are employed, and the supply is being enlarged. Although there are "political clouds on the horizon," the sun still shines on the enterprise; and the prospect is in many respects bright and cheering. The Metropolitan Water Companies are attacked simply because somebody wants to get possession of their property. In respect to the quality of the supply, the Chairman was able to quote the reports of eminent analysts as proving its excellence; while the mortality returns showed the healthfulness of Inner and Outer London. We would observe that such facts as those adverted to by the Chairman of the East London meeting would be trumpeted forth with enormous enthusiasm by those who are now adverse to the London Water Companies, if only it so happened that the supply was drawn from Wales or Devonshire, and was under the control of the County Council, or some other public authority. Mr. Banbury alluded in his address to the extraordinary statement lately appearing in an evening paper, which alleged that the prevalence of scarlet fever in London was due to the water supply. It would seem to us about as reasonable to ascribe the outbreak to the proximity of the planet Mars. The fact was cited that Glasgow, with the immaculate Loch Katrine supply, had 24 deaths from scarlet fever in three weeks; while East London, with 200,000 more inhabitants, had only seven such deaths in the same period. Liverpool, Manchester, and Leeds are instances to the same effect. The attacks on the Metropolitan Water Companies were well explained by Mr. Banbury and the East London Company's Engineer (Mr. W. B. Bryan, M.Inst.C.E.) as the kind of depreciation which precedes an attempt to effect a purchase. To this we may add there is the circumstance that the Metropolitan Water Supply has become profitable, and the shareholders in the East London Company are receiving 8 per cent. The comparative freedom from infectious disease in the East London district is the more remarkable, considering the enormous influx of destitute and dirty immigrants. To such an extent does this visitation prevail, that the Company have caused 5000 notices in reference to the right use of the water supply to be printed in Hebrew, for distribution among the Jewish arrivals.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 653.)

A PRONOUNCED change in the general position of business is at length apparent in the Stock Exchange. A decided revival of activity, coupled with a degree of free and unrestricted dealing to which the markets have long been strangers, has produced a much better feeling, and a hopeful view that the wretched depression which has so long prevailed is now really coming to an end. So the past week has been buoyant and active, although things became quieter during the latter portion, owing to the Jewish holidays. Money has commanded rather better rates; but there is nothing to point to any substantial variation. The Gas Market has been more active, and the tendency throughout continues in favour of higher prices. The Metropolitan Companies were especially brisk. Gaslight "A" was a good deal dealt in every day, at very steady figures; the price never going outside the limits of 216 to 217½. There was less doing in the secured issues—the demand for investment purposes being temporarily satisfied; but the few transactions marked showed undiminished values. South Metropolitan "B" was wanted, and pretty liberally dealt in at higher figures. Sellers of the "A" also raised their price by 5; but no business was done. Very little was done in Commercials; but prices inclined upwards. This fact, and the advance of 2 in the old stock on Saturday, seem to indicate that the market was satisfied with the position and prospects of the undertaking, as presented to the general meeting on Friday by the Chairman in his usual plain unvarnished tale. The evident candour and straightforwardness with which he addresses the proprietors commands their confidence. Suburban and Provincial undertakings continue perfectly placid, and without a sign of change beyond the nominal advance of 5 in Crystal Palace, without business done. Of the Continental Companies, Union continues to creep up by single steps; and Imperial is ½ higher. Of the rest, the only one to move is San Paulo, which has regained 1 in view of the issue of Wednesday's meeting. Nothing much was done in Water, except Lambeth, which remained stationary. Kent and Southwark advanced 2 each.

The daily operations were: Gas was moderately active on the opening day; but the tendency to rise was not manifested all at once. Southwark Water rose 2. On Tuesday, Gaslight issues were most dealt in, at steady figures; quotations remaining unchanged. On Wednesday the general advance set in. South Metropolitan "B" was very active, and rose 2; ditto "A," 2½; and San Paulo, ½. Thursday was a very quiet day, and quotations were left standing. Gaslight "A" furnished nearly all the business on Friday. Variations were but slight; Imperial Continental and San Paulo gaining ½ each. Saturday's business was quite up to the average; and prices all round were good. Commercial old advanced 2; Continental Union, 1; and Crystal Palace, 5. In Water there was a rise of 2 in Kent.

ELECTRIC LIGHTING MEMORANDA.

The Prospects of the Brush Company—Electric and Gas Lighting in Belfast—A Novel Scale of Discounts—Tests of Incandescent Lamps.

THERE was a good deal of oratory at the recent meeting of the Brush Company; the Chairman and Deputy-Chairman labouring with "fluency, fervour, and zeal" to show that the 6 per cent. dividend recommended by the Board ought to be regarded in the light of a humdrum trade profit, such as the shareholders may expect to receive in future years, and not as a merely speculative gain. The official speakers repeated with suspicious vehemence the assurance that the Brush Company have attained to stability as a trading concern, because electric lighting has at length entered upon the commercial stage of its development, and is making real and steady progress therein. It just occurs to us that we have heard a good deal of the same kind of assurances before. There is no denying that the Brush Company do a large amount of work as a manufacturing concern; but they are not mere manufacturers of machinery and apparatus—they make companies also. They had a great deal to do with the negotiations which resulted in the establishment of the City of London Lighting Company, who are now their best customers. Most of the profit placed last year to the credit of the Brush Company came from this source, and they have still £240,000 to draw upon the City of London lighting contract. Naturally, while this job is in hand, the Brush Company will be able to make a satisfactory showing. They have been eight years nursing the infant which is now making such a dutiful return for the care lavished upon it; but whether the youngest and largest of "grandfather Brush's" numerous progeny will prove strong enough to lead an independent existence, and whether it is to have any successors, are mysteries to which the Future holds the key.

How difficult it may be for a Municipality to drive gas and electricity supply as a "pair," may be learnt from the assaults which the Belfast Corporation are enduring at the present time. Fear of electric lighting has induced the Belfast Gas Department to starve the gas-works for the last ten years; and now an extensive scheme of gas-works enlargement has to be decided upon at the same time as a Corporation electric lighting experiment is to be taken in hand. Both responsibilities have been

postponed as long as possible; and it is only due to the weakness and indecision of the Corporation that they fall together after so long waiting. The coincidence affords to local critics of the Corporation too tempting an opportunity to be lost. There is consequently an outcry from the partisans of electricity against the idea of extending the gas plant, upon the well-worn argument that electricity is destined to be "the light of the future," and that therefore the Corporation ought rather to lay down large electric lighting plant than to spend money upon gas apparatus which is bound to become obsolete in a few years. Of course, these irresponsible prophets ignore the pressing question of how Belfast is to be lighted during the next year or two. Probably Mr. Stelfox would be only too glad if an Electric Lighting Department of the Municipality could take his troublesome increase. If the local disbelievers in the permanence of gas lighting would only look across the water to their big neighbours Glasgow and Liverpool, they would learn something. Glasgow supplies itself with both gas and electricity; but the extension of the gas-works goes on unceasingly without the smallest reference to the supply of electricity. In Liverpool both gas and electricity are provided by companies; yet, with all the good-will possible on both sides, the electricians cannot relieve the Gas Company of the necessity for extension.

A novel device—we had almost written dodge—has been hit upon by the Yorkshire House-to-House Company, with a view to reducing the proportion of non-paying lamps upon their Leeds town circuits. The Company expect to be in a position to supply current in December at the standard price of 8d. per unit, subject to discounts based upon the number of hours per quarter during which the current is used; each customer being called upon to declare the maximum number of lights required to be at work at any one time. For not less than 250 hours' use per quarter, the discount will be 10 per cent., rising to 25 per cent. for 700 hours' use, with a further discount of 5 per cent. for cash within a month. The effect of the discounts will be to reduce the net charges for current to figures varying from 6¾d. to 5¼d. per unit. Our contemporary the *Electrician* remarks, with reference to this proposal, that while it is doubtless a disadvantage to a central lighting station to have connected with its mains a large number of lamps which are seldom, if ever, used, but which nevertheless entail the provision of a surplusage of plant, the more general method of allowing rebates, irrespective of all other considerations, to all customers whose quarterly bills exceed a certain minimum, would appear less likely to lead to disappointment.

In the number of the *Electrician* for the 30th ult., there appears a translation, with diagrams, of an instructive article by M. Charles Haubtmann, which originally appeared in the French journal of the same name, upon the endurance of incandescent lamps of the different makes now used on the Continent, and certain to be introduced into England when the Edison-Swan monopoly expires. All tests were made with batches of ten lamps, which were tried at the voltage marked by the maker, and also at a slightly higher potential. Every 50 to 60 hours the lamps were taken down and tested one by one; the consumption of current and candle power being noted. Fifteen types of lamp were tested; and it is worth recording that, while the illuminating power always fell off from the first, in some cases very rapidly, the English Edison-Swan held out best. Some of the lamps never gave their rated illuminating power when new, and dropped to one-half of this figure in less than 250 hours. The consumption of energy varied from 33 watts for 10-candle lamps to 67 watts for 16-candle lamps; while the average endurance varied from 300 to 1800 hours. Some makes of 16-candle lamps, including the English Edison-Swan, maintained their brilliancy at 102 volts throughout the test period of 1000 hours at the average for which they were rated; the actual maxima rising at the commencement to 18 candles, and falling to minima of 14 candles at the end.

The New Croton Dam of the New York Water-Works.—In the JOURNAL for Sept. 27 we announced the award of the contract for the construction of the new Croton dam for the water supply of New York to Mr. J. S. Coleman, of that city, for $4,150,573. The following particulars, taken from the *Engineer*, will convey an idea of the magnitude of the work. The site of the new dam will be on the Croton River, half way between the old dam and the proposed Quaker Bridge dam. The new dam will be partly of masonry and partly of earthwork. It will be 1200 feet long, and 680 feet of it will be masonry. The spillway will be 1000 feet long. It will be about 160 feet high at the highest portion of the masonry section; and the foundation will extend about 80 feet below the river bed. The base of the dam will be 185 feet thick in some places; and the crest will be 20 feet thick. The outer face will have a slope of 2 vertical to 1½ horizontal. The highest portion of the earthwork section will be 120 feet above the present ground-level. Its apex will be 30 feet wide; and on this there will be a roadway 18 feet wide. The earthwork is to be laid in 6-inch layers. The excavation for the base of the dam will be carried down 125 feet. The stonework will be of rubble masonry, faced with cut stone. The spillway, which will be 24 feet lower than the dam proper, will be of masonry, lined with cut stone. The new dam will raise the water in the Croton River 36 feet above the top of the present dam, and will impound 34,000 million gallons of water.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS AT BIRMINGHAM AND COVENTRY.

THE question whether it is practicable to bring the members of a national society of gas engineers and managers together for a day or two in the autumn, must be regarded as answered in a highly satisfactory affirmative by the proceedings of the early part of last week, when, by the invitation of Mr. Charles Hunt, President, the members of the Incorporated Institution of Gas Engineers assembled in good force for an informal open-air meeting in Birmingham and Coventry. The circumstances which led up to this experiment may be shortly explained here, in very much the same terms as were employed on Tuesday by the President when responding to the vote of thanks for his pains in the matter. From the foundation of the Institution, when the regular meetings were fixed in the early summer, it was considered by many leading members to be desirable that the whole body should be brought together oftener than once a year. Accordingly, at the first ordinary meeting in May, 1891, a supplementary autumn meeting was arranged for. As the latter season drew near, however, doubts arose in the minds of certain members of the Council as to whether the fixture could be duly observed. Some prominent gas engineers were known to be away on a late holiday; and others declared their inability to attend by reason of urgent affairs at home. The natural result of harbouring distrust of success followed—the idea of the meeting was given up as the presumed less of two evils. We remarked at the time that the failure was greatly to be deplored; and Mr. Hunt shared this sentiment, although he said nothing to confess his disappointment—only registering the resolve to do all that lay in his power, when opportunity should serve, to repair the lapse. His election to the Chair for the current year gave him the occasion for which he was waiting; and he has now triumphantly demonstrated that, given the proper conditions, the Institution of Gas Engineers can hold an autumn meeting not less successfully than it can celebrate a summer session. A gathering of members of a technical society may be judged according to two standards—the number of the company, and the character of the proceedings. Last week's meeting will bear either test. Although there was no calling of the roll or "signing in" to furnish exact figures, and many members, as usual, did not take the trouble to notify their intention to be present, it was estimated that between 70 and 80 meant to attend on Tuesday. And with respect to the programme of the day's proceedings, it is enough to say, in general terms, that it was just the right thing for the occasion and the company.

The meeting practically began on Monday evening, when members of the Institution converged upon Birmingham from all parts of the country. And here it should be remarked that the accessibility and central situation of the place of meeting had much to do with the production of the satisfactory result, so far as the size of the gathering was concerned. It is not every town which happens to be equidistant by rail from Glasgow and Dover, as Birmingham is, and can accordingly be comfortably reached during an afternoon and evening, after a good morning's work has been accomplished. As a matter of fact, so many of the visitors arrived in Birmingham betimes on Monday evening, that, if an unlimited opportunity for talking "shop" be regarded as an essential feature of every assembly of technical workers usually cut off from congenial companionship, much of last week's Institution business was done before the meeting properly commenced.

At half-past nine on Tuesday morning, the President was in evidence, according to programme, and held a cordial if informal reception of his guests under the portico of the Queen's Hotel. The head-quarters of the Institution were then shifted, by brake, to the Windsor Street Gas-Works of the Birmingham Gas Department, where ample provision had been made for the reception of the party and the piloting over the huge establishment of groups of visitors by the members of the executive staff, five of whom—namely, Mr. A. P. Ker, Mr. R. V. Milne, Mr. H. Woodall, Mr. E. L. Pryce, and Mr. B. R. Parkinson—were in attendance for this purpose. The three principal foremen—Messrs. F. S. Green, F. Charlotte, and D. Layton—were also on hand to explain the details of their respective departments; so that if any visitor quitted the works after all unsatisfied in regard to any point of curiosity upon which questions might be legitimately asked, it was not the fault of Mr. Hunt or his assistants. We can bear emphatic testimony to the patience and assiduity of all these volunteer chaperons. No attempt was made to prescribe the routes to be taken through the works, or to insist upon the subdivision of the party. Everything was freely thrown open for inspection; and the guides waited upon the visitors with a view to supplying desired information, rather than constraining them as to the way they should go.

The big retort-houses, with the new settings of inclined retorts, were, of course, the centre of attraction at Windsor Street, although ample opportunity was afforded for looking into the various shops and engine-houses passed *en route*. Mr. Hunt has recently remodelled the connections in the exhauster-house; increasing the plant by a very fine compound engine by Messrs. W. H. Allen and Co., driving a pair of 150,000 cubic feet exhausters. The neat design of this machinery, which includes a barring-engine for turning the fly-wheel, was

the subject of much favourable comment. A pair of Babcock and Wilcox water-tube boilers for burning breeze are attached to the exhausting plant; no difficulty being experienced in burning the smallest and dirtiest fuel in the furnaces of these boilers, with the necessary provision of thin fire-bars spaced very closely, and a slow-speed fan for forcing the draught. Gas-engines for driving the machine tools, and a Tangye's gas-hammer, are also in use here; but Mr. Hunt complains humorously that the exhibition of gas-power machinery in a gas-works is not accepted by the community outside as convincing evidence of its economy.

To proceed, however, to the chief object of Tuesday's inspection—the inclined retorts—it should be premised that the principal point of novelty in the Windsor Street "slopers" consists in their having been set in arches which were originally built for horizontal retorts; structural alterations having been avoided as far as practicable. To prevent misapprehension on the part of readers, it must be remarked that this would not have been possible but for the existence of a deep coke-hole, and the possibility of going even a stage lower for the necessary generator furnaces. The lower mouthpieces of the inclined retorts open into what was formerly the coke-hole, upon the ground-floor level; and the stage has been removed on this side of the bench in order to afford clear head-room for working—an arrangement which permits of the discharging operations being watched with ease. The higher mouthpieces of these retorts, which are set at an angle of about 29° with the horizontal, come out above the ordinary level of the former mouthpieces; thus necessitating some cutting away of the arches at the charging end. On the whole, there has been less structural alteration of the retort-stack itself than might have been expected. Fourteen arches have been converted in this way; so the experiment is upon a sufficiently large scale to give reliable results. The arches are all 8 ft. 8 in. wide and 20 feet long, containing nine 21 in. by 15 in. ⏢ retorts; and these in consequence of the angle at which they are set, measure 22 ft. 7 in. in length, exclusive of the mouthpieces. These retorts are formed with shoulders on the upper and lower sides, as patented by Mr. Hunt, to allow of horizontal bedding. The charging apparatus is also a speciality of Mr. Hunt's, and is not the least satisfactory element in the combination. The coal is first broken, and then elevated to a continuous hopper, inside which it is distributed by the agency of a band conveyor. From the continuous hopper, it is fed through shoots placed at intervals of about 5 feet into the charging-hopper, which has a capacity of 10 cwt., and forms the top member of the traversing carriage that contains all the appliances for charging.

The actual charging of these inclined retorts is a simple matter, more especially when the charging mouthpieces are in the line of the retorts, and project clear of the front of the arch. In Mr. Hunt's arrangement, the whole of the contents of the hopper goes into one retort; so that the only movable parts are the carriage itself (which can be brought in front of any retort), the gear for adjusting the shoot of the hopper to the retort intended to be charged, and the shutter which is opened to allow the charge to fall from the hopper upon the sole of the shoot. At present the charging-hopper is raised or lowered by hydraulic power; and the frame in which it is mounted is advanced or retracted, bringing the coal-shoot in or out of the mouthpieces, by the same means. The lower carriage, on which the whole is borne, is traversed by hand. Two men at present work the charging machinery; but it is in contemplation to so modify the gearing as to enable one man to attend to everything, which he could easily do. Eight-hour charges are worked at present, which consequently means that every through retort carbonizes 30 cwt. of coal in the 24 hours. The charges are therefore to be described as heavier than is usual for horizontal retorts.

After witnessing the arranged amount of drawing and charging of the inclined retorts, the visitors passed round the rest of the plant; halting for awhile to admire the strong, workmanlike gas-holder guide-framing, which enables Mr. Hunt to sleep quite peacefully o' nights "while the stormy winds do blow." Before returning to the conveyances, a pause was made at an experimental oil and water-gas plant which is being erected under the supervision of Dr. Dvorkovitch; but it was unfortunately not completed in time to exhibit the results of the system. The idea of the plant is to carburet water gas, generated in a pair of producers (and consequently continuously), by oil gas made separately, by carbonizing Russian distillate oil in small pipe retorts; the mixture being afterwards passed through a kind of superheater in order to fix it. A reference to the remarks of Dr. Dvorkovitch at the May meeting of the Institution, as given in the JOURNAL for May 24 last, with respect to the efficiency of small-pipe retorts in producing benzol as a residual of the carbonization of Russian petroleum, will give the reason for this style of apparatus.

Upon the return of the members to the Queen's Hotel, they were entertained at luncheon by the President, who was supported by the ex-President, Mr. G. C. Trewby, and by Mr. John Methven, the Vice-President, and the other members of the Council. Although there was no speech-making, Mr. George Livesey made a suitable acknowledgment of the indebtedness of the Institution to Mr. Hunt, who replied briefly; and then a move was made for the train which was to take the party to Coventry. Here the members were received by the Chairman of the Gas Committee (Mr. Andrews) and by Mr. George Winstanley, who personally conducted them to the installation of inclined retorts, which is just now the most striking feature of the gas-works. A clearance has here been made of an old retort-house and some adjoining buildings; and thus the erection of a commodious new house has been rendered feasible. The building itself is light and airy. The installation of inclined retorts is wholly new. It has been a heavy piece of work, in consequence of the nature of the subsoil, which has been excavated to a depth of from 11 to 13 feet, in order to obtain a firm foundation. Twelve arches have been built, all 7 ft. 6 in. wide and 13 feet long, containing six 26 in. by 15 in. ⏢ retorts, with oval mouthpieces of the same dimensions at the discharging end. The mouthpieces at the charging end are 18 in. by 15 in. The total length of the retort, exclusive of the mouthpieces, is 15 feet, and the retorts are set at different angles; the lowest tier being at an angle of 30°, the middle one at about 30½°, and the top one at 31°. The idea in this modification is that the retorts which are so situated as to allow the coal the greatest fall from hopper to mouthpiece need less slope inside for the proper spreading of the charge than those which give less fall. Mr. Winstanley must be credited with having worked out this plant according to a carefully considered and most complete plan. His well-known system of gas-firing is applied to the settings; one generator, at the drawing end, being used for each arch. Any desired degree of heating can be obtained by this means; while the generators themselves remain remarkably cool, and easy of working. The coal is broken and elevated to a push-plate conveyor, which discharges into fixed tanks, each holding about 40 tons. This plant is in duplicate. The charging-waggons traverse upon one level, and serve the whole length of the bench. They are in pairs, each taking a 7½ cwt. charge, which the retorts work off in six hours. Mr. Winstanley hopes, however, to do the charging shortly upon a more wholesale scale.

This is not the occasion for pronouncing judgment upon the inclined retort system of carbonizing, as carried on either at Birmingham or at Coventry; still less for comparing the working at one place with the other. It was very good of both Mr. Hunt and Mr. Winstanley to exhibit their working to a host of professional critics, among whom the propensity to find fault is at least as common as the habit of admiration. We prefer to commend both for their public spirit in attacking a problem of notorious complexity in the light of day, regardless of what might be said by the prudent gentlemen who are to be found in the profession of gas engineering as elsewhere, and whose wisdom is summed up in the declaration of their willingness to "let somebody else try it first." Time will show how far the inclined retort system meets the requirements of the age; but the needed experience will not be gathered by those who stand aside with folded hands, and let others bear the burden and heat of the day.

Before quitting the gas-works, the visitors enjoyed a welcome cup of tea; and thereafter having made due acknowledgments to the Chairman of the Gas Committee and to Mr. Winstanley, they paid their respects to several of the local "sights." These included the grand parish church, reputed to be the largest, as it certainly is among the handsomest, of the parish churches of the kingdom; St. Mary's Hall (now the municipal buildings); and other interesting relics of past times. This concluded the business of the meeting, which was thoroughly successful and enjoyable; but several of the members stayed on in Birmingham, for the sake of an excursion to Warwick and Stratford-on-Avon, which was arranged for Wednesday. We cannot leave the subject without recognizing the efficiency of the work done by the Secretary (Mr. Thomas Cole, Assoc.M.Inst.C.E.), who acted up heartily to the cordial and hospitable tone set for the assembly by the President.

Sinking a Flexible Water-Main.—In a recent number of the *Engineer*, an account was given of the sinking of a flexible water-main into the Maas at Rotterdam; the work while in progress being shown in an engraving made from a photograph. In consequence of the increase in the population on one side of the river, the present pipes are found to be much too small to afford the needful supply of water for the inhabitants, and for the factories and hydraulic cranes. A new and larger pipe was accordingly determined upon; but to sink it in the river-bed was a difficult task, for the traffic is heavy at that point. It was impossible to make a wooden structure on which a long length of pipes could be bolted together, and then, when finished, lowered horizontally, as is usual in sinking gas and water pipes in the Belgian canals. Therefore a flexible main was constructed, composed of short pieces connected with ball joints. Each pipe is 23½ inches in diameter and 0·4 inch thick, made of mild steel, and provided with steel flanges. The ball unions are of cast iron, having an outside diameter of 4 ft. 6 in. To sink the main, two barges are fastened together, and between them is constructed a wooden inclined platform about 120 feet in length, one end of which hangs in the furrow made in the bottom of the river to receive the pipes. The tube is built up on this platform; one end of the pipe being made fast on the bank. Afterwards the barges are pulled back so far that there is room enough on the platform to put on another length of pipe with its ball joint, and so on. The length of one pipe with its union is about 29 ft. 6 in. The depth of the river is 36 feet.

NOTES.

The Colours of Incandescent Metallic Vapours.

A communication upon the colours of the light of incandescent metallic vapours has been made by Dr. W. L. Dudley to the *American Chemical Journal*. Dr. Dudley's experiments are not without some bearing upon the practical problem of incandescent gas lighting, in connection with which it is important to ascertain the behaviour of all kinds of finely-divided refractory substances when strongly heated. Dr. Dudley's researches were twofold—one set of experiments being concerned with the preparation of films of different metals so thin as to transmit light, the colour of which was observed and compared with that emitted by the incandescent vapour of the same metal. These experiments were very numerous, and embraced a great variety of metallic elements. Summarizing his results, Dr. Dudley states that a thin reguline (*sic*) and coherent film of a metal transmits light of a colour remarkably similar to that emitted by its incandescent vapour. The colour of the vapour of a metal varies with its temperature; as, for example, the vapour of sodium, which just above its boiling-point is purple, while at incandescence it is yellow. The vapour of potassium is first green; at incandescence, it is violet. The colour of the incandescent vapour of a metal is the resultant of the colours of the various rays emitted; and it depends on the number and intensities of these rays. In none of the examples given by Dr. Dudley is the colour of the light emitted by the incandescent metallic vapour white; the tints ranging from violet to red—the greens and blues preponderating.

The Roberts-Austen Recording Pyrometer.

At the recent meeting of the Iron and Steel Institute, Professor Roberts-Austen read a paper descriptive of an appliance or automatically recording the temperature of furnaces. The method depends upon the exposure of platinum-rhodium thermal junctions to the heat; the junctions being connected with a central laboratory, where the indications of a reflecting galvanometer are utilized for the production of a photographic record. The spot of light from the mirror of the galvanometer is caused to fall upon a sheet of sensitized paper fixed round a brass cylinder 6 inches in diameter, moved, at the rate of a single revolution in twelve hours, by clockwork mechanism contained within it. The portion of the camera which contains the cylinder can be detached from the rest of the apparatus, and removed to the dark room for the development of the trace upon the paper. Sir Frederick Abel spoke very highly of the simplicity of the arrangement described by Professor Roberts-Austen; and Sir Lowthian Bell, speaking from long experience of the working of thermo-junctions, said they are to be depended upon. Out of some 300 junctions employed by him in pyrometrical work, only a few had failed; and their cost is so small that the loss of a few is not comparable with the gain on the whole. Formerly, he remarked, it was left to workmen to say whether the temperature of a particular flue or furnace had been kept up to the mark; but with the thermo-junction apparatus, the temperatures could be checked from the laboratory at any moment.

Sulphate of Ammonia in France.

In an official report upon the artificial fertilizers shown at the Paris Exhibition—now just published, and favourably commented upon in the French technical press—M. Girard, who is the head of the Chemical Department of the National Agronomic Institute, refers to the importance of nitrogen in cultivated soils; remarking that the lack of this element is the commonest cause of the barrenness of land. It happens, also, that Nature only supplies nitrogen to soils in small and insufficient quantities; whereas everything sold off the land takes away some of it, and the drainage water carries off a large proportion. Going on to refer to the artificial sources of nitrogen at the disposal of the modern agriculturist, M. Girard dwells upon the importance of the sulphate of ammonia obtained as a residual from the distillation of coal in gas making. He estimates the average proportion of nitrogen in coal at 1 per cent.; and he takes the total consumption of coal in Europe and the United States at 200 millions of tons annually—corresponding to more than 20 million quintals of ammonia. If simple and efficient means could be devised for the collection in useful form of all the ammonia poured into the atmosphere by factory chimneys, agriculture would have at command a profusion of nitrogenous manure which the soil needs. M. Girard states that the recovery of sulphate of ammonia is still neglected by many of the smaller French gas undertakings; but those French gas companies that make sulphate turn out, according to him, a superior article. M. Girard mentions and commends M. Chevalet's process for concentrating ammoniacal liquor until it has a strength of 19 to 20 per cent. of ammonia; then it is absorbed by superphosphates, producing a nitrogenous superphosphate. He states that by saturating superphosphate of lime with ammonia, both sulphate of ammonia and phosphate of ammonia are made in the mass, and this without lead tanks, evaporation, or free acid. The superphosphate is, however, retrograded or rendered insoluble, and becomes a mere absorbent—as, for example, in dynamite the inert infusorial earth is the absorbent of the active principle. It remains to be judged whether this is an economical way of treating superphosphate. M. Girard appears to think that it is so in France under existing conditions; because the acid comes cheaper to the artificial manure manufacturer in the form of superphosphate than in carboys.

Elephant Boilers.

In the course of their comparative tests of the efficiency of steam-boilers, Mr. Bryan Donkin, jun., and Professor Kennedy had a special trial conducted by M. Scheurer-Kestner of an example of the so-called elephant, or French type of boiler, with external fire. This is practically a water-tube boiler, and is a pattern much used on the Continent. There are three horizontal tubes about 20 inches diameter immediately over the furnace, communicating with a superior tube about 4 feet in diameter. A Green's economizer is used with the boiler tested. Burning the standard coal selected by the authors for all their tests (which was sent out for the purpose to M. Scheurer-Kestner's works at Thann, Alsace, at considerable expense), it was found, as the mean results of a 31 hours' run, that the evaporation per pound of coal from feed temperature was after the rate of 9·93 of water per pound; or an equivalent of 12·65 per pound of coal pure and dry. Of the heat evolved, 65·5 per cent. was absorbed by the boiler, and 13 per cent. by the economizer; 6·5 per cent. went in heating the furnace gases; 5·5 per cent. was lost by radiation; and 9·5 per cent. was unaccounted for. This was not at all a bad showing for the boiler—which is of a type that has never been ranked high for efficiency.

Mr. Alderman Avery—who, as announced in last week's issue, has resigned his seat in the Birmingham City Council—is to have the honorary freedom of the city conferred upon him as a recognition of his eminent services, more especially as the first Chairman of the Water Committee, and a member of the Sewage Committee and Drainage Board. This dignity is only shared by the Right Hon. Joseph Chamberlain, M.P., and the late Mr. Phillip Henry Muntz. The Mayor (Mr. Lawley Parker) has been unanimously elected to fill the seat vacated by Mr. Avery on the aldermanic bench.

Messrs. Richmond and Co.'s Improved Gas-Fires.—In the new gas-fires now being introduced by Messrs. Richmond and Co., Limited, of Warrington and London, two changes have been made in the heating arrangements for which special advantages are claimed. Instead of the gas passing to the burners from the ends of the supply-pipe, these are closed, and it is conveyed through an additional pipe, forming a mixing chamber, to the centre of the line of burners, flowing right and left to them. It is said that by this means a more complete mixture of gas and air is secured, that its consumption is steady and noiseless, that the pressure may be reduced to 6-10ths, and that the gas will not fire back. In conjunction with this improvement, Messrs. Richmond are using a new kind of cylindrical fuel.

American Gaslight Association.—The twentieth annual meeting of this Association is to be held in Boston (U.S.A.) on the 19th, 20th, and 21st inst., under the presidency of Mr. W. H. White. According to the official notice of the meeting issued by the Secretary (Mr. A. B. Slater, jun.), six papers have been promised. Mr. A. C. Humphreys, of Philadelphia, will deal with the relation of theory to practice in gas manufacture; Mr. J. M. Rusby, of Jersey City, will take up the subject of water-gas condensation; Mr. Walter R. Addicks, of Boston, will treat of the position of gas associations and their members; Mr. G. Osius, of Detroit, will discuss the question of saving and properly concentrating ammoniacal liquor; Mr. C. R. Collins will discourse on the anthracites of the United States; and Mr. A. E. Forstall will relate some experiences as to the best burner to be used for a mixture of coal and water gases in about equal proportions. It will be noticed that there are fewer papers than usual this year. This is explained by Mr. Slater to be due to the late withdrawal of some of those promised. However, the shortness of the list will allow of fuller discussion; and more time will be afforded for developing the possibilities of the "question-box."

A Deep Artesian Well.—An artesian well at Galveston, Texas, has been sunk to a depth of 2920 feet, and is to be carried down to 3000 feet. The pipes used range from 22-inch at the top to 6-inch at the bottom; but as each size of pipe extends to the top of the well, the interior diameter is 6 inches all the way down. The material is mainly sand of various grades, with occasional clay and sandstone; and the bottom is in soft clay and fine sand. A water-bearing bed of sand was struck at a depth of 886 feet, and others at various points down to 2567 feet. The machinery used was a Chapman well-sinking machine; the pipe being hung from a timber derrick 98 feet high. The pipe is clamped to the centre of a revolving plate; and the bottom section is fitted with strainers, valves, and the cutter. The cutter is like a cylindrical saw, with teeth of different depths, so that, if a loose stone is struck, the tendency will be to turn it over, and not cause an obstruction. A powerful hydraulic jet is pumped down through the tube, and flows up through the space around the tube; the diameter of the cutting section being rather larger than that of the tube. The cutter has an elliptical motion, vertical and rotary—rising slowly and falling rapidly, so as to strike a powerful blow. The motion is reversible in case of any obstruction being caught in the cutter. The contract price was $75,000 for the 3000 feet.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Discussion on Mr. Tobey's Paper.

In connection with the general report of the proceedings at the half-yearly meeting of the above Association, held at Seaham Harbour, on the 1st inst., under the presidency of Mr. J. Whyte, which appeared in the JOURNAL last week, we published (p. 594) the paper read by Mr. H. Tobey, of Malton, entitled, "Notes on Asphalte Paving." We now complete our record by giving a report of the discussion which took place on the paper.

Mr. J. NICHOLS (Darlington), in opening the discussion on the invitation of the President, expressed regret that he had not had much experience in connection with asphalte paving. He said there was a good deal of it in Darlington. They supplied a large quantity of tar to the Corporation; but the work was done by the Streets Committee, and not by the Gas Committee, who had nothing to do with it.

Mr. J. HALL (West Pelton) said that he quite appreciated the paper. He had watched the process of making asphalte paving for upwards of thirty years, and had noticed that in many towns it was a great encumbrance. It was all very well in winter, when the weather was cold; but when summer came, there was a rent in the way, and, as it were, a leaking out of the footway. He quite agreed with Mr. Tobey as to the durability of the asphalte to which he had referred. The North-Eastern Railway Company used this material. He was not aware what they did; but up North the most satisfactory platforms they had at their stations were entirely made with the asphalte described. Of course, they had asphalte of all kinds put down; and it was found that the platforms were very easy to alight upon. The members should thank Mr. Tobey for his paper, because there was sometimes difficulty in getting their tar away. He had thrown out many hints to them; and they were now in a position to look about. They had to keep their eyes open, whatever else they kept shut; and it was a good thing to get an outlet for some of their products.

Mr. D. TERRACE (Middlesbrough) said he had listened with great pleasure to the paper; but he must confess he was very much in the position of Mr. Nichols with respect to the Local Authority. He expected, however, to hear something not only of the foot-pavements, but of the pavement of the streets; because in Middlesbrough the Corporation went a step farther than Mr. Tobey had spoken of, and laid certain of the streets with tar. He had been in gas-works where the whole of the yard, instead of being paved, was laid with a tar covering; and he should like to hear from Mr. Tobey how the composition he had given would stand being carted over. This was an important matter; and if Mr. Tobey had had any experience in regard to it, he should very much like to know how it should be treated.

Mr. L. H. ARMOUR (Gateshead) said that, as a member of a Local Authority on Tyneside, he could bear testimony to the fact that a good deal of interest was being taken in the subject before the members; and a really permanent pavement would, he believed, command a considerable market. There was one matter he was watching for with great attention, and that was the renewal of the surface. He was glad this point was dealt with satisfactorily in the paper, because the difficulty with that work was that they were apt to lose the original skin; and if Madame Rachel's prescription could be used, it would remove a very considerable difficulty. A good deal of prejudice, he thought, had been created against asphalte paving by the bad way in which the work was done at one time. Reference had been made to the North-Eastern Railway Company; and he could refer specifically to one station—Forest Hall—where the platforms had been laid with that material, and had become like a geological formation. There were ribs like some Silurian bed cropping out; they looked like a splash of tar ribbing out. This was due to bad work, and, as it seemed to him, to the stuff being laid down dry, and the tar afterwards swilled over it. The Railway Company were not doing anything in this way now; and what was done some years ago was not, he believed, carried out according to the specification Mr. Tobey had placed before them. There was a good opening for the use of asphalte in cemeteries and yards; and if it could be made firm enough to be carted over, it would be a great advantage indeed.

Mr. D. M. NELSON (Glasgow) remarked that, at a meeting held in Newcastle a few years ago, a paper on a somewhat similar subject was discussed; and since then he had taken a good deal of interest in these matters. Tar was a very essential element in relation to asphalte; but he thought there was a great deal of ignorance with reference to it. Soft pavements arose through the material not being solidified—through too much oily substance being left in it; and in large cities, such as Glasgow, they sometimes found that they dare not cross the street for fear of their feet sticking to the asphalte. He thought coke had more to do with that subject than almost anything else. Some years ago the Factor on the Marquis of Breadalbane's Taymouth estate asked him (Mr. Nelson) if he could suggest any means whereby he could put a flooring into the kennels and stables at Taymouth Castle. He thought over the matter; and, believing strongly in coke, he made an effort to get a hard, dry, crisp coke. But there was scarcely such a thing to be had in Scotland. The coke from shale was not suitable; and he thought that, if he could have obtained Newcastle coke, it would have answered. He, however, used the best he could get, fresh from the furnace; and with it and a little lime, with tar free from oil, and cement, he made up a concrete pavement. About 40 or 50 tons of the stuff were used; and he had reason to be very pleased with the result. He believed that the Marchioness of Breadalbane, when she visited the stables, found them free from that offensive odour usually perceptible in places where cattle and dogs were kept. The material employed had a disinfectant effect. He thought he had, since the morning of the previous day, made an enormous stride towards the solution of the question, as he had with him samples of coke obtained at Leeds, which he thought was the nearest approach he had seen to a suitable material. [Mr. Nelson handed the samples round.] It was, he said, free from all tar, ammonia, sulphur products, and everything of the kind; and it was altogether the very thing required for asphalte. It had the advantage of not being combustible, for the carbon was really taken out of it. It made a rigid surface; but it was also elastic, and horses falling upon it were not liable to cut their knees. It was interesting to the members, as gas makers, to know this, because coke was at present unsaleable. This coke was really destructively distilled, because there was nothing left in it. A blacksmith told him he could not heat a ¾-inch bolt in it. This was an evidence of what could be taken out of coal. It occurred to him that it would be interesting to bring this matter forward; because, if only gas managers could produce a coke like this, it would form the element wanted for concrete or asphalte paving.

Mr. EMINSON: What percentage of cement did you use in making the floor?

Mr. NELSON: Just sufficient to bind it—to counteract the effect of the tar; perhaps about 10 per cent. It made an excellent surface, and was slightly elastic. One could almost watch the depression of a horse's hoof upon it; and yet it came back smooth.

Mr. T. BOWER (West Hartlepool) said he had listened with much interest to the paper and the discussion, inasmuch as, for a period of more than seven years—during the time he was resident at Lytham—he employed all the tar that was produced at the gas-works in processes somewhat similar to those which had been described. It seemed to him that one of the main points which should be observed, if tar was to be used for asphalte, was that a still should be first put up for distilling the tar, so far as the first runnings were concerned. It was useless to employ a tar which contained ammoniacal liquor; and it was almost equally so to put it down if it contained the first light oils. When he started to use tar, the first thing he did was to erect a small still, with the view of taking the tar just at the point he considered most suitable for making asphalte. He might say that he did this with considerable success, inasmuch as it mattered not whether tar was high or low in price, he was able to realize something like 20s. per ton more for it than if he had put it into the open market. This experience differed somewhat from that of Mr. Nelson, because he found that coke was one of the worst possible substances they could use, unless it was employed with a thinner top surface of something else. Being of a spongy character, coke was subject to atmospheric influences. He had frequently found that pieces of coke, when affected by the air, came out entirely; leaving in the asphalte patches that were altogether disagreeable. He finally abandoned the use of coke, and reverted to limestone chippings. At one time he procured some Welsh whinstone chippings; and he found both were equally good for making a top surface. His method was, in the first place, to put down a bottom layer, about 2 inches thick, of any refuse they had on the works, and other things they could pick up, such as shingle from the seashore. But it was to the top coating they paid most attention; because, unless they had a fine surface on the top, the asphalte very soon began to break up. He found one of the secrets in laying asphalte was the rolling of it, so as to get it into a proper mass with a smooth surface. Such troubles as Mr. Nelson had mentioned, with reference to being unpleasant to walk upon, could be overcome by using a proper admixture of the materials. If they put in too much tar, it was always objectionable. It was equally so if they used too little; and it was only by the careful study of the subject they could obtain proper results. He certainly thought it was a matter which deserved the attention of gas managers, seeing that the price of tar was at present so very low; and, so far as he was concerned, he did not consider there was very great probability of their doing much better in the matter. At West Hartlepool the gas supply was in the hands of a Company, apart altogether from the Corporation; but if the latter should come their way and be disposed to purchase tar from them, and give them a guarantee that they would take a certain quantity, he should not be at all surprised if his people would be prepared to put down plant to distil it for them. But he certainly should not advise anybody to adopt the practice of simply taking tar out of the well and laying it down. Unless it was prepared in the way mentioned by Mr. Tobey, or by distilling, he did not think satisfactory results could be attained; but, if the quantity to be used would warrant the outlay, it certainly was, in his opinion, a matter they ought to look closely into.

Mr. C. HUTCHINSON (Barnsley) ventured to hope the members would excuse him, an outsider, making some remarks. So far as footpath-paving was concerned, he thought there could be very little doubt about it. Mr. Terrace asked for information about road making. In his neighbourhood, he thought there were some of the best roads to be found in England. The material used was slag from blast-furnaces, which was broken up into suitable sizes, about 2 inches square. Then it was screened, and the finer portion used on the top. In the borough of late years, they had mixed the larger "checks" with tar, boiled until they were thoroughly covered over, and then the top part was treated in the same way as the smaller stuff, and the whole was rolled with a heavy steam-roller; some broken limestone being first sprinkled on the surface. In this way they obtained the best surface they could have. It was quite smooth, and was a great deal less noisy than even wood paving. If it had a fault, it was that the roads were a little dangerous in greasy weather—not wet weather; but this might be owing to the formation of the road, and not to the material, or to the employment of too much tar. But it made a capital roadway, which would bear any traffic. He was rather surprised to hear that this was not generally known, because it was quite common in his neighbourhood.

Mr. BOWER said he should like to have made himself a little clearer on the subject of roadways and footpaths. They had used for their roadways macadam mixed in a similar way to that adopted for the footpaths; and he might say that fully 75 or 80 per cent. of the roads about Lytham were of Welsh limestone mixed with tar, and laid down in the same way. One great saving they found in this was that they had not nearly so much dust as upon ordinary macadamized roads. The only objection he ever heard to it was from gentlemen driving high-stepping horses, who complained that they were apt to slip on it, especially in frosty weather. But as far as carting was concerned, they had no difficulty. He had seen trucks weighing 13 or 14 tons go over these roads.

Mr. H. LEES (Hexham) said he went to the meeting in the hope and expectation that he would hear something that would be interesting to him. He had been thinking over the tar question for some time, because he might adopt some such process in his own works, and, if it were successful, he might make it a branch of his business. There was one part of the subject which had not been dealt with, and upon which the members should, he thought, have further information, and that was the cost of the necessary plant to work the process. Mr. Bower had told them it would be necessary to have a still. This seemed very reasonable; as by that means, he presumed, they would get some advantage by collecting the light oils that would be evaporated. Then Mr. Tobey referred to the screens that would be necessary for preparing the material. Could either Mr. Bower or Mr. Tobey give them some idea of what would be the cost of plant for (say) a small works supplying a town of some 6000 to 10,000 inhabitants? These were matters upon which directors would require to have information before going into experiments. The question of tar was forcing itself upon them. The price for it now was lower than it had been for about ten years; and they would like to counteract this.

Mr. NELSON said he should like to refer to what Mr. Bower had stated, because it rather contradicted what he (Mr. Nelson) had said; and he would have no other opportunity of replying to him. He laid particular stress upon the qualities of the coke he produced. It was a dry, crisp coke. They all knew that coke did wash out of footpaths. But he wished then to disabuse their minds of what Mr. Bower had said; and he wanted to tell them that this coke which he had, when subjected to a road-roller, became as fine as sand, and would not wash out.

Mr. W. FORD (Stockton) remarked that, like his neighbour, Mr. Terrace, he had had very little experience with tar, because the Corporation worked up a great deal of it. In corroboration of the remarks made in regard to the advantages of asphalte, he might say that he had sent thousands of tons of tar to what was called the Queen of Watering-Places—Scarborough—and he thought that everyone who had visited the town must admit that the footpaths were of a very excellent description. He did not say they were so because of the superior quality of the materials he sent them, but the Borough Engineer must know how to utilize these materials. He therefore thought that, if those who were not under corporation control just got on the right side of the borough surveyor of local towns, they would be able to do good to the sale of tar. But there was no need for anyone to use unboiled tar. He thought that any of the tar distillers in the country would be quite willing to meet gas managers or borough surveyors by supplying an article, prepared in a fitting way, for use. This would be better than introducing tar distilling into gas-works themselves, and having naphtha and other light oils floating about the place.

Mr. TOBEY, in closing the discussion, said he was very pleased with it. Mr. Terrace had asked a question with regard to the roadways. His paper did not extend to them; it simply dealt with footpaths. Some gentlemen seemed to think that he had to do with the town footpaths; but he left them to the Local Board. All the footpaths he had to make were for private individuals, in yards and large areas which required to be asphalted. He had nothing to do with the public footpaths. Paving for cart traffic would require the materials to be much stronger. They would want something like road metal, with finer material to fill up the spaces between; and if this were well rolled down, they would have practically a thoroughly waterproof road, and one which, if it were properly formed—up in the middle and down at the sides—would keep itself dry. This was the great advantage of an asphalted roadway—that the water ran off, and did not stand upon it; and the roadway did not become rotten, as macadamized roads often did. One gentleman had spoken about keeping in order the surface of asphalted roads. He knew a society place—the small town of Filey—where they obtained all the tar from the gas-works, and boiled it pretty thick in an open copper, without going to the expense of a still; and they took very fine sea gravel, that would go through about a ½-inch screen, and with this they sprinkled the roadway, and it sank into the tar and set, and made a surface of at least ½-inch in thickness. If a surface was worn down, all they had to do was to put on a new one. If asphalte was to be made properly, it must be thoroughly incorporated. They had to get it well mixed through the mass; and if they did not, it would be patchy—one place hard, and the other soft. Mr. Armour seemed to think it would be exceedingly suitable for cemeteries. Probably this was because most asphalte pavements were black, and therefore of sombre appearance. But there was no reason why they should be black. Materials could be procured which would make the surface white. The sort of asphalte Mr. Nelson had referred to was evidently not due to the tar not being distilled, but to there being too much tar in it. If they heaped it on too thick, it would spray about, and gradually work its way, like the ice of a glacier, very slowly over the edge of the footpath. Mr. Nelson's experience with regard to the asphalte he had put down at Taymouth was rather peculiar. He (Mr. Tobey) did not know how he could make a good stable-yard with such soft materials. He rather thought he owed his success to the proportion of cement he put in. Something like 10 per cent. of cement was a very large quantity; for 7 per cent. would make a very good ordinary concrete.

Mr. NELSON: The men who did it put "brains" in as well.

Mr. TOBEY said Mr. Hutchinson had replied to Mr. Terrace's question with regard to roadways. Mr. Lees asked about the cost of plant. When he himself commenced, he simply used an open copper. They could boil the tar in that way. The light oil and the ammoniacal liquor driven off were not much and it might have a beneficial effect on the neighbourhood, particularly if it were a low one, and not very salubrious. The ordinary way was to boil it in a close vessel, 40 or 50 gallons at a time; and he boiled it until the products came off, and what was left was deposited. Mr. Ford had referred to the capital asphalte they had at Scarborough. The gentleman there—strange to say, his name was Malton—took shingle and stuff from the sea-shore, and put with it coke, or the products of the ash-pans at the gas-works. He then burnt out the coke; and he believed that any small kind of limestone gravel, that might be in the gravel which was collected on the shore, would be left. He did not think he boiled the tar at all. He had not far to go for his material. The sea gravel was excellently suited for making a very hard asphalte. But he might say that the Corporation of Scarborough had recommended that the roads upon which the main traffic occurred should not be asphalted, but that those which were not so much used, and the footpaths on the promenade, should be. It made a very nice, clean, smart town; and the Corporation intended to continue the asphalte paving in this way.

The PRESIDENT said he was sure they were all very much obliged to Mr. Tobey for his communication, which had proved interesting to every one of them. It had been specially so to him. They had enjoyed both the paper and the discussion which had taken place upon it; and he had much pleasure in proposing a vote of thanks to Mr. Tobey.

The proposition was cordially agreed to.

The Cleansing and Ventilation of Pipe Sewers.—At the meeting of the Society of Engineers on Monday last week, under the presidency of Mr. J. W. Wilson, jun., a paper having the above title was read by Mr. B. A. Miller. The author compared the systems of combined and separate sewering, and described the different methods of flushing employed. With regard to ventilation, he stated that provision should be made to prevent sewer gas passing directly into the air; and he proceeded to enumerate the different systems employed for ventilating sewers—describing first the usual method by shafts from the sewer to the street-level, with open gratings in the roadway, intended to act as outlets and inlets, but which, he said, were often an annoyance, owing to the irregularity of their action. Briefly mentioning the use of charcoal filters, and the utilization of chimney-shafts, he referred to the Holman-Keeling sewer-gas destructor, of which a description has appeared in the JOURNAL. He considered this effective, though costly; and he suggested the erection of iron shafts, either open at the top or provided with cowls, which could take the place of street lamps, placed on the line of kerb, and connected with the sewer. He recommended, in order to keep sewers in their proper state, periodical flushing by automatic chambers, and an efficient method of ventilation by posts, which, he thought, would produce a better current of air in the sewers than is obtained by the ordinary method of street openings alone. The paper was illustrated by diagrams.

OTTO'S PATENT AERIAL ROPEWAYS.

Our attention has recently been called to the Otto system of aerial lines for the transport of coal, coke, lime, &c. It is evident that such lines offer, in a number of instances, great advantages, since by this means material can be cheaply and easily conveyed over rivers, canals, buildings, &c., where it would be either impossible, or very costly, to use an ordinary railway. The Otto system, we learn, is now most extensively employed for the purposes named; no less than 500 of the lines being at work in various parts of the world. Their rapidly spreading introduction indicates how keenly the necessity of effecting economies is felt under the stress of ever-increasing competition. The chief characteristic of this system of transport is the employment of two ropes—a heavy fixed carrying rope, and a light travelling hauling rope. The buckets are fitted with various forms of grips for attachment to the hauling rope, according to the gradients that have to be surmounted. Long experience with this means of transport has resulted in perfecting the various details, and rendering the working as safe and reliable as an ordinary railway. Ten years ago, loads of more than 2 to 3 cwt. were rarely transported. But at present it is not an uncommon practice for single loads to weigh 8 to 10 cwt. and even more; so that the lines are now capable of conveying from 600 to 800 tons per day of ten hours. Just as marked as the increase in carrying capacity has been the increase in length of the lines; and there are now ropeways working over distances of 9 miles and upwards. These facts prove that the field for the employment of these lines is open to great extension.

The following brief description of the most important features of the system will, we think, make the working of them clear: The carrying or fixed ropes are of special design; stout steel wires being used in their construction. These carrying ropes are fixed at one terminal, and rest in shoes on the supports along the line; being kept taut by means of heavy balance weights at the other terminal. In this way the ropes are free to move with the varying loads and changes of temperature. The hauling rope is endless, of smaller diameter, built up of strands of fine steel wire with hempen core, in order to be as flexible as possible. It passes round large grooved pulleys at the terminal stations, one of which moves in a slide, and is connected with a balance-weight which keeps the rope taut. The standards or supports are made either of wood or iron. Fig. 1 shows the design

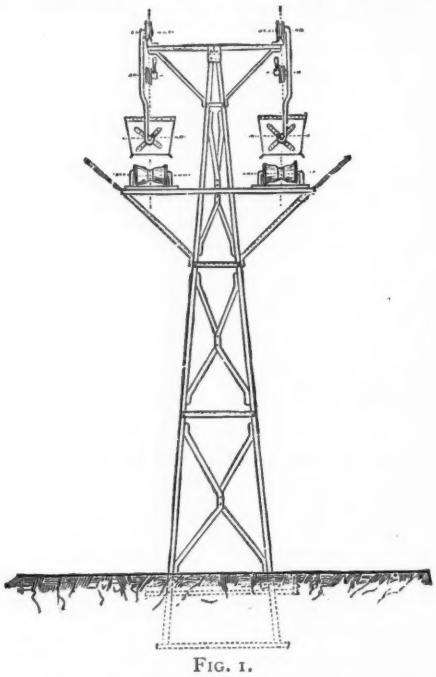


FIG. 1.

of an iron one, and illustrates the way in which the buckets pass. These standards support the ropes, and are usually placed 100 to 200 feet apart. Under special circumstances, spans up to 1500 feet can be employed; but such great spans are not recommended, unless the ground be such as to preclude the employment of intermediate standards. The carriers or buckets are of various designs to suit the material to be transported. For coal, coke, limestone, iron ore, or similar materials iron buckets similar to fig. 2 are usually employed. An important feature of the carrier is the truck or runner. The frame consists of two steel plates, with a central cast-iron distance piece, through which the spindle of the hanger passes, and two phosphor-bronze distance-pieces at either end, serving at the same time as spindles for the grooved wheels. These

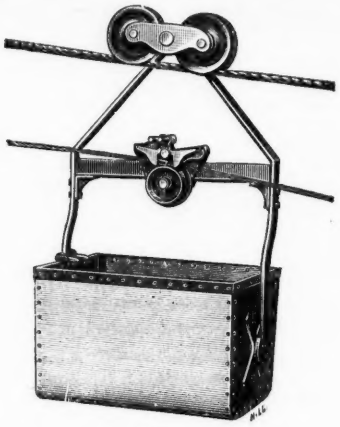


FIG. 2.

spindles are hollowed out to hold grease or other lubricant, which can be inserted by removing screw plugs at the ends.

Another important detail, to ensure the regular working of a line, is the design of coupling or grip, by which the carriers are attached to the hauling-rope. These are usually of two kinds, either frictional or positive, according to the gradient of the line. Both the frictional and positive grip couplings are automatically released from the hauling-rope at the unloading station, and allow the buckets to be switched off on to sidings. A considerable number of these grips are now at work, and are giving perfect satisfaction. It is indeed largely due to the care that has been bestowed on their design that the great success of the "Otto" system is to be attributed.

The design of the stations can be arranged to suit special requirements. As a rule, the loading station is on the ground level; and the buckets are pushed along the shunt rails by hand, and filled from spouts from large storeage bins. The unloading stations are more commonly at a considerable elevation; so that the material transported can be either delivered into bins or on to floors for storeage. It may be mentioned, in conclusion, that the manufacturers of these ropeways in this country are Messrs. Commans and Co., of 52, Gracechurch Street, E.C.

Society of Engineers.—Sir Henry Roscoe, M.P., F.R.S., has recently been elected an honorary member of the above Society, in place of Professor J. C. Adams, M.A., D.C.L., &c., deceased.

Abolition of the Reaumur Scale in Germany.—Orders have been issued from the Ministry of Public Instruction and Medical Affairs of Germany to the effect that, as from the 1st of January next, the centigrade thermometer is to be exclusively used throughout the empire. The Réaumur thermometer will therefore be abolished.

"A Substitute for the Sun" is the description given by the *Engineer* of the Mount Washington search-light, which is said to be the largest and highest in the world. Its elevation is 6300 feet; and it is calculated to have 100,000-candle power. The current is 90 ampères; and the voltage 56. A French lens of 30 inches diameter is used, whereby it is calculated that a beam of light will be thrown by which a newspaper may be read at the Fabyan House, six miles distant. It is expected that every hotel within twenty miles of the summit can be illuminated by the search-light; and that evening lawn parties and tennis tournaments will be added attractions at each.

The Expiration of the Lowe Patent.—Our American contemporary *Progressive Age* records, in the following high-flown language, the very commonplace fact that the patent for the Lowe plant for the manufacture of water gas has just expired: "In the month of September, year of Our Lord Eighteen-hundred and ninety-two, there terminates a life of more than passing interest to our readers. A short life, its span covering a period of but seventeen years, yet eventful beyond the common; a life in which misunderstanding and misconstruction, contempt and controversy, charges of malformation and illegitimacy have been fought, conquered, and lived down, and, in its later days, succeeded by a general admission of personal worth and a universal acknowledgment of honourable parentage. Coming into the world with a promise of good to a great industry—a promise now gloriously redeemed—it found its pathway beset with prejudice, its motive impugned, and its progress hampered by the very interest it was most to benefit. All this has passed; and, as its friends watch the going out of this life, it is with the consciousness that its victory is won, and that its light shall shine before men as long as gas making is a present industry, and petroleum wells hold out to flow. Unconscious of the warfare it has caused, unconscious of its own great triumph, and the consequent good to friend and traducer, this great life comes to an end—unconscious, because documents and grants are insentient, and the life of which we write is the life of the Lowe Patent."

REGISTER OF PATENTS.

Gas-Chandeliers.—Austin, C. D., of Newcastle-on-Tyne. No. 15,969; Sept. 21, 1891.

The object of this invention is to prevent the roaring or blowing of gas-burners on chandeliers by providing means for the simultaneous and instantaneous adjustment of them all to any variation of pressure and consumption of gas, so as to produce a steady light. This is attained by attaching, by screws or other means, to the bottom or under side of the distributing chamber or globe, to which the burner arms are attached (and preferably in a direct line with the gas-supply tube, attached to the top side of the distributing chamber), a tube formed to receive a screwed valve-spindle, carrying on its upper end a valve to regulate the amount of gas discharged from the main supply-tube into the distributing chamber. The spindle, which projects through the lower end of the regulating-tube, is provided with a stuffing box and gland; and, when turned in either direction, it raises or lowers the regulating-valve, and correspondingly diminishes or increases the supply of gas.

Gas-Engines.—Clerk, D., of Sutton Coldfield. No. 16,404; Sept. 28, 1891.

This invention relates to the valve details of "Otto" cycle gas-engines; and also to the construction of incandescent or hot-surface igniters, applicable as well to other types of gas-engine.

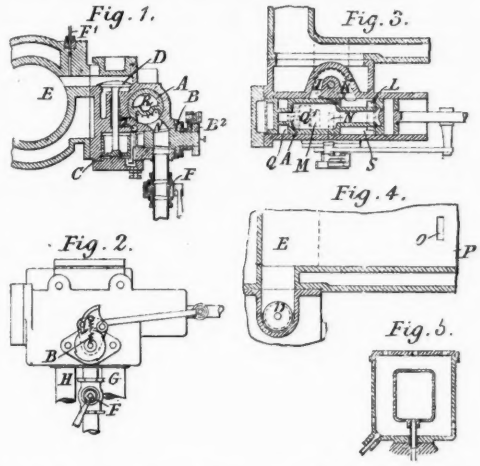


Fig. 1 is a transverse section through the valves and combustion space of the engine; fig. 2 is an external elevation of the valve arrangements; fig. 3 is a sectional plan of fig. 1; fig. 4 is a sectional plan of the cylinder showing the front exhaust port; and fig. 5 is a section illustrating the igniter.

The patentee proposes to dispense with the "two-to-one" gear usually employed; and to actuate the exhaust-valve D by means of an air-compressing piston A, directly connected to an eccentric or other arrangement moving with every revolution of the crank-shaft, as described in patent No. 12,413 of 1891. A valve B, rotated by a ratchet wheel and pawl, causes the air-piston to compress when it is required to open the exhaust-valve as there described. In the present invention, however, it is arranged to dispense with a separate gas-valve, and have the gas cock or valve and the rotating air-valve as one plug-valve, to fit in a conical or other aperture or shell. This rotating gas and air control valve is shown at B, fig. 1. In the interior or exterior of the gas-cock plug, is a rotating plug to control the supply of gas to the engine; and this plug is rotated by a pawl and ratchet, driven from a reciprocating piece attached to the eccentric rod—the plug rotating the separate air-plug behind it, by a flat and check, or other connection. It is preferred, however, to form the gas-valve and air-valve in one piece, as at B, fig. 1. The apertures in the two plugs or combined plug are preferably arranged so that, when the air port is open, and the exhaust-valve D therefore keeps closed, and when the gas port remains shut, the gas is shut off. A separate gas and air valve is thus dispensed with; and one exhaust lift-valve D is made to serve the double purpose of inlet and exhaust. Thus only one lift-valve opens to the engine cylinder; and the pressure of the explosion is taken by one valve only. To enable this to be done, the air-compressing piston A (which acts on the exhaust-valve through a separate piston C) is also arranged to discharge exhaust gases, and feed air and gas. Suitable ports, as Q S (fig. 3), are arranged in it; so that at each revolution of the engine, on every back stroke, the piston-valve port S opens the space I K below the lift-valve D to the exhaust-pipe G (fig. 2). At every forward stroke of the engine also, the space I K below the lift-valve is opened, by a port or ports Q in the piston-valve A, to the air and gas supply. H is the air-pipe, which communicates by the air port M, shown in dotted lines in fig. 3, with the fork of the forked part I K, below the valve D, by way of the port Q in the piston-valve. Gas is supplied by the cock F to the rotating plug B by a passage, from which it flows through N (fig. 1) to a hollow in the piston-valve, and from this hollow by the holes R to the air-port Q, where it mixes with the air, and passes into the engine cylinder. The movement of the lift-valve D, however, determines whether the "in" stroke of the engine piston shall be an exhausting or a compressing stroke, and also when the outward stroke of the piston shall be a suction stroke or an explosion stroke. The rotation of the air-plug and the gas-plug, or combined air and gas plug B, is so arranged that, at every second return stroke of the engine, the exhaust lift-valve D is held open by the compressed air accumulated under the piston C; and so the contents of the cylinder are discharged through the lift-valve and through the port S in the piston-valve and L in the piston-valve cylinder. When the engine piston P (shown in fig. 4) reaches the "in" end of its stroke, and commences its next "out" stroke, a charge of air is sucked in through the lift-valve D, and the piston-valve A; and with it, there is a charge of gas by way of the rotating gas-plug B and the piston-valve A. By this arrangement a combination is formed giving the necessary "two-to-one" action on the exhaust lift-valve D; and the lift-valve is caused to perform the double function of exhaust, discharge, and inlet for the combustible charge—the piston-valve A serving to time the exhaust discharge, and the air and gas inlet.

One end of the piston-valve A is used to compress air to work the separate exhaust-valve piston; and it opens at every forward stroke of the piston-valve to the air port M, and is so charged at every stroke to make up for loss by leakage. Communication is made between the space at the end of the compressing part of the piston and the piston C by a passage T, controlled by the port in the plug B, and further regulated by a pin in the cover. The port leading to the combustion space E serves both as inlet and exhaust port. F is an igniter-tube leading into D. The engine piston P (fig. 4) preferably passes over an exhaust-port O in the side of the cylinder; so as to discharge the pressure down to the atmosphere, and thus reduce the pressure required to lift the exhaust-valve D, and diminish the volume of exhaust discharged through it.

The second part of this invention consists of an arrangement of igniter tube or chamber, shown at fig. 5; and it is intended to enable the usual external heating of the igniter-tubes to be dispensed with, and replaced by the heat generated by the explosions.

The tube or chamber, made of considerable internal capacity, is connected, by a tube of relatively small section, to the explosion chamber To start the engine, the exterior of the tube or chamber is heated in the usual manner by a burner; but when the engine is started, this is extinguished. The considerable volume of mixture fired within the tube or chamber at each explosion, then supplies heat to make up for the losses in the intervals between the explosions; and the tube continues to fire regularly, although the external heat supply is withdrawn. The temperature of the hot tube or chamber is regulated according to the strength of the combustible mixture employed, so as to produce an explosion at the end of the compression stroke; and the temperature is raised by increasing the protection against the outer air, and diminished by allowing greater access.

Gas Fires and Stoves.—Bird, S. V., of Balsall Heath, and Wood, J. S., of Birmingham. No. 16,807; Oct. 3, 1891.

This invention, relating to open gas fires or stoves, is said to be an improvement upon patent No. 8983 of 1891; the present invention consisting primarily in fitting such fires or stoves with supplementary or additional canopies, whereby the heated air immediately before the open front, is conducted in a pure state into the room, instead of being drawn into the fire by the draught created in the fireplace consequent upon combustion. Thus, in an ordinary open gas-fire, a simple canopy is employed at the upper boundary part of the opening, which gathers in air to the fireplace for combustion. The air in front of, or approximate to, the open front, is warmed by radiant heat; and if allowed to remain there, it is only drawn into the fire without heating the room. But the object of the present invention is to so construct such an open gas fire or stove, by adding thereto an additional canopy, that the air, heated by radiation, and emitted from the open front of the fireplace, shall be utilized more efficiently in warming and heating apartments.

Gas Motor Engines.—Lee, R. A., of High Holborn, W.C. No. 18,424; Oct. 27, 1891.

This invention in gas-engines relates to the admission of the gas and the arrangement of governors and valves for this purpose; also to a self-contained silencing chamber for the exhaust.

To a rotary shaft, worked by the motion of the piston, the patentee proposes to attach a hinged tube or cage, made capable of being elevated or depressed from a horizontal position to an angle of about 75°. It is open or cut away on the lower side about one-third of its diameter and a length equal to about one-and-a-half times its diameter. In it is inserted a metal ball, fitting easily and free to run up and down; the cage being inclined at an angle and revolving with the shaft. The ball rests, in its normal position, at the end of the cage nearest the shaft; and at a defined position, it comes in contact with a knife-edge circular path, connected to the gas-valve, depressing it and the valve admitting gas to the cylinder. Should the speed of the engine exceed its defined rate, centrifugal force causes the ball to run out to the end of the cage, which is provided with a spring to prevent any tendency of the ball to stay too long at this end. When the ball is at the end of the cage, it misses the circular path, and does not open the gas-valve; the effect being a reduction of speed and consequent return of the ball to its normal position.

In compression engines, the ball would pass the path (either to hit or miss) at each alternate revolution of the crank-shaft; and the shaft working the air and exhaust valves would carry the governor. But when it is desired to get great regularity of speed of the engine under varying loads, the governor is geared to revolve at equal speed with the crank-shaft; and there is attached to the circular path an additional path made to spring out at one revolution, and held in the way of the ball by a cam at the next revolution. In this way it causes it to miss the path, which opens the gas-valve when the piston is on the explosion stroke, but opens it (when required) on the suction stroke.

APPLICATIONS FOR LETTERS PATENT.

17,262.—Bidelman, R. M., "Manufacture of gas." Sept. 27.

17,287.—Hamer, J., "Shield or cover for electric gas-lighting purposes." Sept. 28.

17,301.—Noakes, D. W., "Gauges used for ascertaining the pressure in compressed gas cylinders and other reservoirs." Sept. 28.

17,394.—Newton, H. E., "Manufacture of illuminating gas." A communication from R. N. Oakman, jun. Sept. 29.

17,427.—Hartley, J. W., and Kerr, J., "Compound and other gas-engines." Sept. 29.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Anthracene.

SIR,—I have received another letter from Mr. Smit, of Amsterdam, who informs me that the gentlemen whose opinion he quoted, but which he did not believe, now say there are substitutes for anthracene, but they do not name them; and as the Society of Chemical Industry of Amsterdam, with which they are connected, is a tar-distilling company, it may be supposed that they, as buyers of tar, are anxious to buy it cheap.

I was informed that the stock of anthracene in the hands of tar distillers in this country is very low. I now, however, hear that practically the only stock of any importance is that held by the Chartered Company; and the fear is that that Company will again force a sale of their stock on an unwilling market, with the result of further depressing the price. I said to my informant: "But what would you have the Chartered do?" His reply was prompt, to the effect that the tar distillers would be quite willing to carry the stock jointly with the Company until the market is ready to receive it. All, therefore, that seems to be necessary is for the Company to confer, and come to an agreement with the tar distillers—in number a very small body of men—and thus, by united action, put an end to their exploitation by the foreign colour makers, who are realizing such large profits.

The vague talk about substitutes for anthracene may now be dismissed. But it may perhaps be contended that the production of anthracene is occasionally in excess of the demand; and if so, what are the makers to do? Hitherto at such times they appear to have sold it for what they could get, and have thereby permanently lowered the price, while the buyers have laid in a stock which has enabled them to hold out against a return to reasonable prices when their need increased. Therefore if the Chartered Company put their present stock on a market that does not want it, and sell at what the buyers choose to give, they will still further place the control of the market in the hands of the colour makers. Suppose, however, that, with the increasing demand for gas (though there is generally very little increase this year), the supply of anthracene should overrun the demand, it would surely be practicable for the tar distillers, by united action, to reduce production, or the makers of tar could burn a portion. It is not likely that there would be any considerable excess; but a very slight excess is sufficient to cause a great reduction in the price. But suppose, for the sake of argument only, that there should be an excess so large even as 20 per cent., what would be the result? The price is now 9½d., or (say) the even figure of 9d., per unit. Let 100 represent the entire make, and we have $100 \times 9 = 900$. Reduce the supply by 25 per cent., and thus bring it below the demand, when, if I am correctly informed, the price might well be raised to 2s. 6d., and we should then have $75 \times 30 = 2250$, or an increase of 150 per cent. in the income from anthracene.

If what has been advanced by myself and others on this subject is correct, the only thing necessary for its realization is joint action on the part of the tar distillers, for which all that is wanting is the co-operation of the Chartered Company. If, on the other hand, the course suggested is impracticable, even then a conference would be advantageous in removing distrust and misapprehension, while it would at least tend to the discovery of the cause of the present low prices.

Oct. 7, 1892. GEORGE LIVESEY.

Mr. Gadd's Mechanics.

SIR,—In reference to Mr. Milbourne's last letter, I can well understand him acknowledging his inability to reply to my requests. He might, however, attempt to reply to at least one, which up to now he has simply evaded doing. How he thinks dealing "with them in a general sense" (very general, I am afraid) goes to the root of the matter, is one of those mysteries which will require very clever elucidation. As to his remarks regarding the conclusion of my article, your readers know that I did not push myself forward in the matter. I was asked to deal further with the subject; and I responded. It so happens I require a recognition of certain mechanical principles, as put forward in all the text-books, to enable me to make my conclusions clear. These are denied me by persons who have some reason or belief of their own for obstruction. I have no wish to intrude upon your columns in any way; but surely "truth" is of some value to all concerned.

I admit that my article did not only "throw doubt" upon Mr. Cripps's formula for determining the pressure upon the tank guides, but distinctly disproved its applicability or truth. This was done, not from misunderstanding Mr. Cripps's article, but because I understood it too well. I say such a formula does not determine the pressures on the tank guides. I have already proved this fact in a number of ways, and can, if needed, prove it by other means in addition.

The formula I inserted in my last was, of course, never used by Mr. Cripps or Mr. Milbourne. I certainly never accused them of such a mathematical proceeding; but, all the same, it is not one of my own devising, for it is identical in formation with the general formula, for the purpose of finding the centre of known parallel forces, put forward by Dr. Todhunter, Professor Rankine, and other writers of text-books. When Mr. Milbourne says I have denounced this formula as absurd, he simply states what is absolutely untrue; as a child might easily see by reading my letter. I said that Mr. Cripps's formula contained a *reductio ad absurdum*, which, I will add, anyone may find for himself by taking moments round lines or planes other than the diameter. A different centre of pressure will come out in calculation for every case.

It is perfectly right, when one requires to find the bending moment of any beam or cantilever, to employ the theory of moment of inertia in what Professor Rankine calls the "conventional" sense, when we may apply it to lines and areas certainly. I never said anything to the contrary. Indeed, I complained that, in the mathematical caricature indulged in by Mr. Milbourne, he had utterly—for his own purpose—ignored the lines and areas in the circle he professed to deal with. I have never asserted that it is impossible, by any means, to find the centre of pressure from a study of the moments of inertia. But Mr. Milbourne has not accomplished this; and, so far as I know, Mr. Cripps never attempted it. What I have said was, that in the original problem as laid down by me, and in which the holder was deprived of weight, the moment of inertia certainly does not come in. If, however, Mr. Milbourne desires to state a new problem—viz., to find the centre of pressure by means of an investigation into the moments of inertia taken geometrically over the lines and areas within the circle, by all means let him do so. But he must not immediately ignore the existence of these lines and areas, and conveniently assume them all to be equal!

Mr. Milbourne will find that engineers *do* need proof that my quotations are inapplicable; because these were taken from chapters and sections dealing with identically analogous problems. It would be well for your correspondent if he could realize how foolish a man looks who continually asserts, and then declines to prove.

As for taking the consequences of any errors I may make, I shall do so cheerfully; and those who know me know well enough that if Mr. Milbourne, Mr. Cripps, or anyone else, can point out and prove any real error in my work, I shall be ready to acknowledge it without reserve. Do my opponents do this?—the *plus* and *minus* fiasco, to wit, to which they are clearly now ashamed to allude, but have not the candour to admit. Having been publicly charged with errors, I have a right to demand a public proof of the charge; and if Mr. Milbourne declines this, he stands convicted of much wrong by default.

Manchester, Oct. 6, 1892. W. GADD.

Regenerative v. Ordinary Settings.

SIR,—Before going further into the relative advantages of ordinary and regenerative furnaces, it would be interesting if Mr. W. J. Latchford would kindly explain how he calculates his extraordinary fuel consumption of 10·26 per cent., and state the class of coal used, and the coke made and sold per 20 cwt. of coal carbonized.

Stapleton Gas-Works, Bristol, Oct. 8, 1892. D. IRVING.

SIR,—After all that has been written and said upon the subject of gaseous firing, to show its superiority over solid fuel, and the results that have hitherto been accepted as demonstrating this, it is somewhat surprising to find that, with the ordinary system, results equal to the very best and most perfect regenerative methods can be obtained. Few managers would think of incurring the expense necessary for regenerative furnaces if they could obtain the results given by your correspondent Mr. Latchford.

With regard to make per mouthpiece per day, I may say that we have obtained, at my works, upwards of 8000 cubic feet (from retorts 24 in. by 15 in. and 21 in. by 15 in. and 9 feet long), but at an expenditure of fuel which cannot be compared with Mr. Latchford's for economy. We have, therefore, been led to give attention to gaseous firing, not so much with the expectation of increasing the production per mouthpiece, but certainly with the hope of reducing the fuel account. If Mr. Latchford could give the profession, through the medium of one of the Associations, or in some other way, the benefit of his experience, which I am sure is exceptional, he would earn the gratitude of the managers of small works, and probably of some of those in charge of larger establishments.

Oct. 6, 1892. H. L.

The Use of Coal Tar in Carbonization.

SIR,—I was much pleased, when reading the last number of the JOURNAL, to find that the President of the North of England Gas Managers' Association (Mr. J. Whyte) bore out the statement I made at the meeting of the Eastern Counties Association at Yarmouth two years ago upon the use of coal tar in carbonization. I find that his experiment with it agrees fairly accurately with mine. I also thank Mr. Whyte for trying the experiment, as I think it will show to some of the engineers of large gas undertakings that the men in small works are not so stupid as they may appear. If your readers will refer to the JOURNAL for Sept. 23, 1890, they will see what I did at the Woodbridge Gas-Works for one or two weeks in June and August of that year. They will see that I used 80 gallons of tar to 14 tons of coal, from which were made 150,600 cubic feet of gas; being equal to 10,755 cubic feet per ton of coal carbonized. I see that Mr. Whyte made per ton 11,900 cubic feet of gas of 17½-candle power, while mine was only of 17-candle power. I should think he must have employed more tar per ton of coal than I did. I do not know what coal he used. Mine was Pelaw Main; and very dirty stuff we get. I may add that I think it is nearly time gas managers had a voice in this matter; for I believe the directors of a great many gas companies are led away by what their secretary says upon the very thing that concerns them most. This tar question is an important one; and I hope some of your readers will relate their experience upon it in the JOURNAL.

Woodbridge, Suffolk, Oct. 8, 1892. J. E. BUCKLE.

Reduction in the Price of Gas at Keswick.—The Directors of the Keswick Gas Company have decided to reduce the price of gas 9d. per 1000 cubic feet. A few years ago the figure was 5s. 5d. The first reduction was to 4s. 6d., and subsequently to 4s. for illuminating purposes and 3s. 3d. for cookers and gas-fires. Now the Directors have decided to equalize the charge—making the price 3s. 3d. all round. This will also effect the saving of meter-rent where consumers have been using gas for other than lighting purposes.

The Wigan Gas Committee and the Electric Light.—A question was asked at the meeting of the Wigan Town Council last Wednesday as to the intentions of the Gas Committee with regard to the electric light. In reply, the Chairman (Mr. Holmes) said only eight or nine people had replied in the affirmative to the Council's circular, which was intended to elicit information as to the possible users of the light if it were introduced. This being so, the Committee did not think they were justified in spending £30,000 or £40,000 on the matter; nor would such a state of affairs justfiy any private venture in that direction.

LEGAL INTELLIGENCE.

HIGHGATE PETTY SESSIONS.—Monday, Oct. 3.

(*Before Mr.* T. GLOVER, *Chairman; and Messrs.* H. J. TUBBS *and* W. REYNOLDS.)

Finchley Local Board v. Barnet District Gas and Water Company; Provision of Water for Street and Sewer Cleansing and Fire Extinction.

To-day the Court was engaged for several hours in hearing two summonses taken out by the Finchley Local Board against the Barnet District Gas and Water Company. The first charged the Company with having neglected to provide and keep constantly laid on, in their pipes situate in the East End Road, Finchley, a sufficient supply of water for cleansing the sewers and drains and for cleansing and watering the streets. The complaint in the second summons was that the Company had neglected to keep a sufficient supply of water constantly in their pipes in Holden Road, Woodside Park North, to which fire-plugs are affixed, and failed to allow any person to use water for the purpose of extinguishing fire.

Mr. A. MACMORRAN appeared in support of the summonses; Mr. BESLEY represented the Company.

Mr. BESLEY submitted, at the outset, that the summonses did not require any answer from the Company, inasmuch as they did not disclose any offence. He pointed out that, under the 37th section of the Water-Works Clauses Act, 1847, the supply of water for public purposes was to be under agreement. There was such an agreement between the parties in the present case; and the Company had supplied water under it.

Mr. MACMORRAN called the attention of the Bench to the 43rd section of the Act.

Mr. BESLEY said the section indicated provided for penalties in case a Company declined to furnish a supply of water in the terms of the agreement. But the defendant Company had not declined. He contended that the Local Board had only a right to summon the Company if they refused to make an agreement; and he urged that the Court ought not to hear evidence.

Mr. MACMORRAN submitted that the objection must fail. He said the Act provided that in all pipes to which fire-plugs were attached, the suppliers of water must keep constantly laid on a sufficient quantity for certain purposes; and section 43 provided for penalties in case of failure to afford a sufficient supply. The Local Board contended that the defendant Company had neglected to fulfil the requirements of both sections of the Act; because, though they entered into an agreement to supply water at a certain charge, no water was at times procurable.

Mr. BESLEY pointed out that the Company were not summoned under the 43rd section. If the words of that section were in the summons, the Company would understand what they had to do; but he was there to submit that there was no good summons before the Bench.

The objections raised by the learned Counsel were overruled.

Mr. MACMORRAN then opened the case on the summons for not supplying sufficient water for public purposes. He said that on the 26th of August last, when water was required from the East End Road stand-pipe for flushing the sewers, it was found that there was absolutely none there. Having proved this fact, he should contend that there was evidence before the Court that there was not kept constantly laid on a sufficient supply of water for this purpose. There was no desire to make the matter anything in the nature of a persecution of the Company; but it was, as the Bench would see, a matter of great importance to the Local Authority. It constantly happened that water could not be obtained, but only one date had been taken for the purpose of this prosecution; and the proceedings had been instituted for the purpose of asserting a right, and settling once for all the liability of the Company to keep their pipes constantly filled with water.

Mr. *A. H. Bevan*, assistant to the Surveyor to the Finchley Local Board, was then called. He deposed to no water being obtainable from the stand-pipe in the East End Road at three o'clock in the afternoon on the 26th of August last; but he said he believed it could be procured at some part of the day.

Mr. *F. Smythe*, Surveyor to the Local Board, said the last witness had, under his instructions, had the supervision of the water-carts, and was constantly sent to see where water could be procurable. On the 26th of August witness wanted some flushing done, and he despatched Bevan to the East End Road stand-pipe to see whether any water was obtainable. A pipe was fixed to the stand-pipe and fire-plug of the Company; and had there been water in the Company's pipes, it must have been forced into the Local Board's pipe. He did not know whether or not there was any written agreement as to the supply of water; but he was aware that the Board paid for all the water they used. A meter was fixed at every pipe.

In cross-examination, witness said the supply in the district was intermittent; and he often had to complain of the absence of water. He had not done so to the Company, but to his Board.

Mr. GLOVER said it seemed remarkable, if it was known to all parties that the supply was intermittent, that there should be any difficulty about knowing the time when the water was on.

Mr. BESLEY: Of course, they could find out; but they did not particularly want to.

Mr. MACMORRAN said what his clients contended was that the supply to the fire-plugs must be a constant one. The Act specifically stated that there should be a constant supply in these pipes.

Witness: The supply we get is perfectly useless for public purposes; and it is very irregular too.

Mr. BESLEY contended that the Company were not bound by their Act to afford a constant supply of water under pressure. Giving an intermittent supply only, they could have cut off the water supply for 20 hours out of the 24. He understood, by the Local Board coming there, that they wanted to use the Court as a means for demanding a constant supply, when an intermittent one was the proper thing for the district. In 1883 the Board, in conjunction with other local bodies, tried to force the Company to give a constant supply. A Committee of the House of Commons was occupied for four days over the matter, and finally decided that they would not order a constant supply, but that the Local Authorities, on giving proper notices, and having all the houses provided with proper fittings, could call upon the Company to afford one. But they were not to give it at a height of more than 300 feet above Ordnance datum; and this was more. The Board had never given the notices; and to save the expense of proper fittings, they now sought surreptitiously and designedly to give the go-by to the Act of Parliament, and force the Company into giving a constant supply with the existing fittings. The supply was intermittent, and the Local Board could always have information of the time the water was turned on in the different districts. He could only characterize the action of the Board as monstrous. He had been a Director of the Lambeth Water Company for twenty years, and was acquainted with the unfair attempts that were constantly being made to damage water companies. It was the fashion now-a-days to make an immense number of misstatements concerning them. They were treated as "bloated capitalists," and local authorities tried to find out means to prevent any interest being paid on their capital. It was the curse of the age; and people who obtained employment by the use of capital would find it out in time. Local boards like that of Finchley, who possessed any legal knowledge at all, ought to be ashamed of themselves for issuing such summonses as those now before the Court.

Mr. *T. H. Martin*, Assoc.M.Inst.C.E., the Company's Engineer and Manager, was then called. With regard to the stand-pipe in the East End Road, he said it was 310 feet above Ordnance datum; and at this time of the year, the water was on under pressure in that road from 6 till 11 a.m. The Local Board need never be in doubt as to when the water was on. There was always water in the pipes; but it was not always under pressure.

Cross-examined: The only agreement between the Company and the Board was as to the price at which they were to supply water. The main was always charged.

The BENCH decided that, under section 21 of the Act of 1883, the Company were not bound to give what the Local Board required.

The summons was therefore dismissed.

Mr. MACMORRAN applied for a special case; and it was granted.

Mr. BESLEY asked that the second summons might be adjourned; but this was objected to.

Mr. MACMORRAN then said that, if the Bench decided against him in this case, it would practically mean that the Company were not under any obligation to provide water for extinguishing fires. On the 26th of August last a fire broke out at about eleven o'clock in the morning at a private house; and, in consequence of there being a delay of three quarters of an hour before the arrival of the turncock, the house was gutted. The Local Board contended that the Company were bound at all times to have in their pipes a full and sufficient supply of water for the purpose of extinguishing fires.

On behalf of the defendants, witnesses were called to show that there had been no undue delay in the arrival of the turncock. The Company were not bound to have the water always under pressure; but if the Local Board had all the fire-plugs fixed to the mains, there would always be a good force of water. When the plugs were fixed to service-pipes, they must employ an engine to pump the water pending the arrival of the turncock. The Board could always get water by pumping from the service-pipes.

The BENCH dismissed the summons, but granted a special case.

Costs to the amount of £5 5s. were allowed on each summons.

The Cost of Electric Light.—Regarding the paragraph bearing this heading which appeared in the JOURNAL for the 20th ult., and in which it was stated that a remarkable letter, written by Mr. Alfred Peck, dealing with the question of the charges for electric lighting, had been read at a meeting of the Wigan Town Council, it is only fair to that gentleman to say he has since explained that, prior to the meeting referred to, he saw the Town Clerk, and acknowledged he was incorrect in his statement as to the charge made by the St. Pancras Vestry, and he left him under the impression that he would at once communicate this to the Mayor.

Electric Lighting for Maidstone.—Electric lighting formed the subject of a long discussion at the last meeting of the Maidstone Local Board. On Aug. 17, the Electric Lighting Committee submitted a recommendation that Mr. W. C. Hawtayne be engaged to prepare plans, &c., for an electric lighting installation, and to act as Residential Engineer for twelve months after the completion of the works; and it now came up for adoption. The necessary resolution was moved by Mr. Barker; and Alderman Long seconded it—the latter gentleman remarking that he felt certain, if the Board adopted electric lighting, the light would pay its own expenses from the first. The Committee had made arrangements for 1200 16-candle power lamps and about 14 or 15 large arc lamps for lighting High Street and Week Street. Of course, these arc lamps would cost a great deal more than gas; but, "when they looked at the result of their use in London, he thought they would agree with him that the expense was far exceeded by the benefits obtained." Alderman Ellis opposed the report, objecting that they had no information as to what the scheme was going to cost. He moved that a rider be added to the recommendation to the effect that the plans should be approved by the Board before the scheme was carried out. Mr. Laurence, who seconded this motion, strongly criticized the estimates which had been made. He pointed out that, while one expert (Mr. Kent) had put the initial outlay at £12,000, Mr. Hawtayne had placed it at £10,000; but he did not think the latter gentleman had allowed sufficient for the buildings. He understood both gentlemen calculated that the charge would be about three times the price of gas. They at present paid about £400 a year for street lighting and the supply of gas to public buildings in the area that it was proposed to light by electricity; but, at three times the price of gas, electricity would cost £1200 for the same amount of light. If they allowed for one-third more light, therefore, it must make the total £1600 for lighting an area now costing £400—or a difference of £1200 each year. After further discussion, the recommendation was amended in accordance with Alderman Ellis's motion; and in that form was adopted.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of this Company was held at the Cannon Street Hotel last Friday—Mr. JOHN BLACKET GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) having read the notice convening the meeting, the Directors' report and the accounts for the half year ending June 30, given in the JOURNAL last week, were taken as read.

The CHAIRMAN stated that, when he addressed the shareholders six months ago, he ventured to foretell that the accounts to June, 1892, would not be very agreeable reading. He knew that they were dealing at the time with dear coal, that the market for residuals was at a particularly low ebb, and that there was not much chance of any reduction in the charges for labour; and although they had raised the price of gas 2d. per 1000 cubic feet, the advance only occurred in the summer quarter, from which, therefore, they could not have derived much advantage. Under these circumstances, he had felt sure that the accounts would not be in the condition they could wish; but he was nevertheless not prepared for presenting the proprietors with so unsatisfactory a statement as that now submitted. He had hoped that they would have been able to "pull through," with their reserve of undivided profits, without trenching on the invested reserve fund. This, however, had not been the case. The year ended June, 1890, was about the last time that they had really earned their dividend, or very nearly so. Since then they had had, as the proprietors knew, to resort to the expedient of taking a great portion of their dividend from their undivided profits—a step which they deplored, but which they had felt compelled to take. In June, 1890, they paid £20,000 less for coal than in the present half year, and received £10,000 more for residuals. The fact was that for some time past they had been working at little profit. In comparison with the corresponding period of 1891, coals had cost in the past half year less by £5300; but this, of course, was independent of the strike, to which he would refer presently. Wages were about the same; but the manufacturing expenses had been less by £5159 than in the June half of 1891. On the other side of the account, they had received £3300 more for gas, and £169 more for stove and meter rental. Their stove trade continued to increase somewhat; and they now had nearly 3900 of these appliances in their district. For coke, however, they received last half year £9800 less; from tar, £3300 less; and from sulphate, £1100 less—or a total of £15,000 less from residuals. They could therefore only carry to the profit and loss account a balance of £22,285. If the shareholders desired to have the usual dividend of 13 and 10 per cent., they must take the remainder of their undivided profits, £18,494, together with their interest account of £495, and draw from their invested reserve £5651. He was very sorry the necessity had arisen for touching the invested reserve fund. But it had been accumulated in prosperous times; and the Directors thought the shareholders might consider it had been intended to meet exigencies like the present. As the Board hoped that it might not have to be drawn upon again, they had determined this year to take this step. The proprietors would understand that, under these circumstances, there was nothing to do but to raise the price of the gas. The Company were not singular in this respect. Others had had to do the same thing; and he thought that any dispassionate observer of the Commercial Company would give them credit for this—that they had always struggled, to the very best of their ability, to keep the price of their gas as low as possible. They knew that they had great enemies in their midst, in the shape of electricity, and, worse still, cheap oil; and it was their bounden duty to supply gas as cheaply as they could. There was, however, a point beyond which they could not go; and they could not permit the finances of the Company to go down to so low a point without taking the step in question. For years they had been content with somewhat less than their statutory dividend, because if they had taken their full dividend, they would have had to raise the price earlier. With regard to the coal strike at Durham, this unfortunate matter had now been settled for some time; and he could not find out that anyone had been benefited by it—least of all the unfortunate men who commenced it. But it had put the Company to great inconvenience and trouble. It had so happened that, a fortnight before the strike occurred, they had a disagreement with their "coalies"—the men who unshipped their coal. This caused the Company to enter into the strike with not such a stock of coal as they would have had had they previously been working regularly. They had, however, at the time the strike occurred, a fair stock of coal on hand. In consequence of the strike, the Directors had to purchase coal in Wales, Yorkshire, and Scotland to make up their supplies; and the extra cost thus incurred amounted to £4175. With the sanction of the Official Auditor, they had taken this from the insurance fund. This sum, however, did not show their real loss, because their working was somewhat disadvantageously affected by using an inferior class of coal. He was reminded by their Engineer, with regard to the disagreement with their "coalies" a fortnight before the strike, that it was not confined to the Commercial Company, but occurred all over London. While on the subject of coal, he wished to refer to a matter affecting its cost to the Company. Sometimes they were compared with other gas companies; and the price paid by them for coal seemed to be a little higher than in other cases. The coal, however, came from the North to their Wapping station, where it was unloaded into trucks, wheeled to the coal-stores, and used in the retort-houses. But in the cases of Poplar and Stepney, the coal came to the Regent's Canal; and they had to pay 1s. 6d. a ton more at Poplar, and 2s. a ton more at Stepney, on account of canal dues. Inasmuch as only 33 per cent. of their coal came to Wapping, the other 67 per cent. had to bear a somewhat higher cost; and this made the price for coal more unsatisfactory than it would otherwise be. He might say that for this year they had obtained a somewhat reduced price for coal; and he trusted they would see the benefit of this at Christmas. But the secret of the bad statement of accounts before the meeting was simply the very low price of residuals. The cement trade was in a bad condition; and tar was almost a drug. Until these things improved, he was afraid they could not get up the prices. They had offered to the proprietors £35,000 of debenture stock, of which a small amount—£4238—was not taken up. By their Act, they were compelled to sell this at the best price they could obtain; and they would do so at some future time—probably by asking the proprietors to tender for it, as usual. He was afraid they would agree with him that the statement now made was by no means a good record; but he most earnestly desired to impress upon them that there was not the least cause for any alarm. In common with other trading companies, they were suffering; but some persons considered that the tide of prosperity was beginning to turn. Indeed, he believed the Chairman of the South Metropolitan Gas Company said a few days ago that he thought coal would be cheaper and residuals at a better price. Most earnestly did he (the Chairman) trust this prognostication would be verified; but for his own part—being, perhaps, not quite so sanguine—he did not think they were yet quite out of the wood. They had circumstances very much against them, and very trying times. He was afraid these were not yet quite over; nor did he think they would be until the existing species of unrest in the labour world had been got rid of, and amicable relations once more subsisted between capital and labour—until, in short, the labourer began to feel that the capitalist was not necessarily his enemy, and that half a loaf was better than no bread at all. When this happy time came, and they got rid of that uncomfortable word which had been on everyone's lips for so long—"depression"—they would, no doubt, advance in prosperity. In the meantime, as Parliament had given the Company the power to put their finances in a more satisfactory state than they were to-day, they could not hesitate to use these powers by making the moderate rise in price from 2s. 6d. to 2s. 9d. He trusted that by this proceeding the Directors would next time have a more agreeable statement to place before the proprietors. He concluded by moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. R. Jones) seconded the motion.

Mr. CARLILE asked whether they could not take a leaf out of the book of The Gaslight and Coke Company, who had raised their price to 3s. 1d., and by that means were enabled last time to pay their dividend without touching their reserve. The Commercial Company were selling their gas for 2s. 9d. per 1000 cubic feet; but this seemed to him to be a great deal too low. Seeing that they were paying so much more for coal, labour, and everything else, and were receiving so much less for their residuals, he thought they ought to increase the price to 3s. (No, no.)

Mr. F. B. BROWN said he had always maintained that these large companies ought not to ask for fresh capital until they were sure they could make it remunerative. There was no doubt that they were on their trial, and they had the electric light to compete with. He was very much in opposition to the last speaker in advocating increasing the price still more. He thought, on the contrary, that they ought to keep it as low as they possibly could. They must be careful not to ask for more capital than could be profitably employed. The Chairman had stated that other gas companies besides the Commercial had raised their price; but he was connected with one or two which had not done so, and had not had to touch their reserves. In fact, he believed that the companies in question were going to lower their price, so great was the competition with electricity. He desired to know whether the expenses could not be reduced; and he thought it probable that more foresight might be exercised with reference to the purchase of coal.

The CHAIRMAN, in reply, reminded Mr. Carlile that, with the present advance of 3d. per 1000 cubic feet, the Company had raised their price this year altogether by 5d., which was a considerable increase. As regarded comparisons with other companies, it must be remembered that the district of the Commercial Company was a very poor one; and in many places it was painful to find how trade had entirely left the locality. It would not do, therefore, to put up their price too excessively, as they had to deal with so many small shopkeepers, who would in that case at once resort to cheap oil. They hoped that the charge of 2s. 9d. per 1000 cubic feet would enable them very nearly to make both ends meet. As to the question of fresh capital, he had forgotten to dwell on this point—that the undivided profits, which they had used for paying the dividend for the last two years, had been a great source of usefulness to the Company. They had really worked with this money; but it was now all gone, and they had lost their £50,000 or £60,000 of undivided profits. They could not, therefore, help making fresh additions to their capital, although it was one of the very last things they would wish to do. Another matter must not be lost sight of. In their days of prosperity, the Company could issue fresh capital, and put a large premium into the proprietors pockets, without feeling the burden of it, for they could then make a good dividend with the new capital, as well as add something to the reserve fund. In these hard times, however, the proprietor was able to get a large premium; but the Company had to pay 10 per cent. on the £35,000 of stock which was issued the other day. This was a hard case for them. Other gas companies sold their stock by auction, and obtained for it a large premium which went to the relief of the capital account. With reference to the Company's staff, he thought they had a very good one; and he did not consider that the gentlemen composing it were particularly expensive. It must be remembered that in working a small company the expenses came out rather larger than in the case of a concern like The Gaslight and Coke Company.

The motion was carried unanimously.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, the dividends recommended were declared.

A vote of thanks was then passed to the Chairman and Directors.

The CHAIRMAN, in reply, thanked the proprietors for the renewal of their confidence in the Board; intimating that it was especially gratifying to them to receive such a vote at the present time when matters were not particularly bright. He then proposed a vote of thanks to the Chief Engineer (Mr. H. E. Jones), the Secretary, and the staff generally; remarking that, while the Directors felt the misfortune, in raising the price, of having to take a kind of retrograde movement, such a step was felt much more keenly by Mr. Henry Jones, whose arguments—which had been acted up to by the Directors to the best of their ability—had always been in favour of lowering the price of gas as much as possible.

Mr. CECIL seconded the motion, and it was carried unanimously

The CHIEF ENGINEER, in reply, said that, however little they might have deserved the compliment, it was never more acceptable to them than it was now. For the first time in his experience of more than 30 years, he had met with defeat in making a continual progress in the reduction of the price of gas. Two axioms had always regulated his official career: Keep down the capital and the price of gas—the two reacting upon each other with great advantage. He could confirm something that had fallen from their friend at the back—that this period of rise of price, though pretty general, was not universal; and he was bound to say that this was the first Company with which he was connected that had had any material advance in price. Though it was general, however, it was not any more satisfactory to him. He was dissatisfied with the condition of things that had compelled it; for he was convinced that that condition was artificial and not natural. In previous times, when coal had been high, they had recovered from their residuals 60 per cent. of the price paid. This time, however, they had not been able to do so; and while their coal had been unduly high, their residuals had scarcely ever been cheaper. There was only one half year, going back for 20 years, when residuals had been about as low; but on that occasion they bought their coal very much cheaper. They were, therefore, now suffering from an artificial state of things, brought about by combination. Remedies had been hinted at by more distinguished gas diplomatists than he was; but he believed that a little more union among the gas companies would save them from being so much at the mercy of outsiders as they were now.

The SECRETARY also replied; incidentally remarking, in answer to Mr. Brown, that it had always been a tradition of the Commercial Gas Company to keep their capital as low as possible. The result of this was that the Company were now working with a smaller amount of capital per ton of coal carbonized than any other Gas Company in the Metropolis.

The proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday week—Mr. E. FOTTRELL, J.P., in the chair.

The SECRETARY (Mr. W. F. Cotton) read the notice convening the meeting; and the Directors' report and the accounts (of which a summary appeared last week) were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said, with regard to the diminution in the profits, this was due to circumstances over which the Directors had no control. This expression was, possibly, a rather hackneyed one; but nevertheless it was perfectly true. But although it was not under their control, it was not beyond their explanation. The shareholders were aware that, at the time of the strike at the Durham collieries, the two firms who held the Company's contract could not deliver Newcastle coals; and consequently they had to go to Yorkshire, Scotland, and elsewhere for a supply. The coal was not so good in quality as that from Durham; and this, of course, had a detrimental effect on the profits, and the balance-sheet was not so pleasing as it would otherwise have been. Another source of income—the sale of residuals—showed a falling off. The price of gas was fixed; but this was not the case with the bye-products. These had to be put on the market; and he regretted to say that the price for them was rather bad. He hoped, however, that the value was now at the lowest possible point. Speaking of the current half year, he said they had concluded satisfactory contracts for the supply of coal; and they would reap some benefit from this. As to the amount taken from the reserve fund, he might state that the fund was created in good and prosperous years for the purpose for which it was now being used—that was, to equalize the rate of dividend. Three courses were open to the Directors—one was to reduce the dividend, another to take the necessary amount from the reserve fund, and the third to raise the price of gas. They resolved to take the second course; and he believed the shareholders would approve of this being done. The reserve fund amounted at one time to £56,000; but during the last three half years they had to withdraw from it £3000, £8000, and £11,000, in order to keep the dividend at the usual rate. The first withdrawals were owing to the strikes; and the £11,000 which they had now to take was in consequence of the increased price of materials. He was glad to say that, notwithstanding the additional quantity of work during the half year, the working expenses and the cost of management were rather less than usual. This was extremely satisfactory; so that it was only the strikes in Durham that were responsible for the reduction in revenue. It was possible that good would come from evil; and he did not think that the Durham colliers would be in a hurry to strike again. He also mentioned that 28 million cubic feet more gas was made in the past half year than in the previous one. This was owing to the large number of people who were using gas for cooking purposes. The Company supplied gas-stoves to their consumers. In doing so, however, they did not wish to interfere with the trade or business of any of their fellow-citizens; but they had the stoves in stock, and wished to sell the gas.

Mr. C. LAWLER seconded the motion, which was carried.

On the proposition of the CHAIRMAN, seconded by Mr. DRUMMOND, a dividend was declared at the rate of 10½ per cent. on the old, and 7½ per cent. on the new shares.

Mr. W. A. BEAKY subsequently inquired how it was there was such a remarkable contrast in the quantity of gas consumed in Belfast as compared with Dublin. There were in Belfast twenty houses which used gas to one in Dublin.

The CHAIRMAN said he could not explain the matter, except by the fact that the Northerns were more canny.

The proceedings then terminated.

Kimberley Water-Works Company, Limited.—The Directors of this Company announce an interim dividend of 2½ per cent. (being at the rate of 5 per cent. per annum), tax free, for the half year ending June 30 last.

SAN PAULO GAS COMPANY, LIMITED.

The Adjourned Extraordinary Meeting of this Company was held last Wednesday—Mr. F. DELMAR, F.S.A., in the chair. It will be remembered that a meeting of the shareholders was held on the 21st ult. for the purpose of authorizing the Directors to create and issue £50,000 of debentures, with interest not exceeding the rate of 7 per cent.; and it was then agreed to postpone any decision on the matter until the accounts for the six months ending June 30 last (which had been received from San Paulo) were produced in proper form, and a report and balance-sheet circulated among the shareholders. This has since been done. The report stated that the profit and loss account showed that the net trading profit had amounted to £13,157; but as this had been, for the purpose of comparison, taken at the exchange of 21d. per milreis, the reduction to the rate of 12d., added to the depreciation of assets in San Paulo from 13d.—the rate at which these were taken on Dec. 31, 1891—caused this sum to be reduced to £3378, which the Directors suggested should be carried to the credit of profit and loss account. Owing to the recent improvement in exchange, and the increase in the price of gas charged to the private consumers, the results for the current half year, the Directors remarked, should show a more satisfactory profit. As to the block at the Port of Santos, this had entailed very heavy expenses on the Company, causing coal to cost more than double the amount it formerly did. To overcome this, the Directors had in view the purchase of land on the Santos River, for use as a coal depôt; and this scheme, if effectually carried out, would obviate all demurrage claims, and materially reduce the cost of carbonizing materials. The business of the Company, it was also stated, had so increased that it was necessary to keep on hand a very large stock of materials. The works had the capacity to supply at least double the quantity of gas now consumed, and applications were daily made for new services and meters; but until the question of providing working capital was settled, as suggested by the proposed issue of debentures, the Directors did not feel justified in authorizing the carrying out of these requisitions, or the purchase of the land above referred to.

The CHAIRMAN, in opening the proceedings, remarked that the meeting had been deferred in opposition to the means proposed by the Board to raise further funds as a reserve fund to carry on the business of the Company, which had been, they hoped, only temporarily interrupted by local disturbances, on which they had entirely failed to exercise any influence. For months together, they had had several cargoes of coal in port, but were unable to discharge the ships owing to the deficiency of pierage accommodation; and consequently there was a great increase in the freightage and demurrage. Indeed, what used to cost £1000 in coal alone, now cost them £2500; and, with the rate of exchange in paper value reduced to less than one-half, this had absorbed what limited reserve funds they possessed. On their last issue of shares, they were not without apprehension as to the necessity for increasing its amount for the possible protection of the Company. The shares then stood at 70 per cent. premium; but, for the support of the reserve fund, they offered the shares at only 5 per cent. premium. In disregard of all consequences, however, the shareholders unanimously insisted on taking the shares at par, giving no help whatever to the reserve fund, but reaping themselves £25,000. Had this sum been available for the reserve, as proposed by the Directors, they believed there would have been no occasion for the working capital they now asked for. Therefore, he urged the shareholders not to place difficulties before the Directors by disputing the means they pointed out as most advisable for the raising of the necessary capital. By this line of conduct, the public would lose confidence in the concern, and more especially so when a shareholder made such a statement, as at a previous meeting, that a broker told him the Company failed to prosper as it ought to do from the utter incapacity of the Directors to conduct its affairs, although, under their entire management, they had paid dividends for the last 12½ years of 10 per cent. per annum, besides giving very large bonuses, and on no occasion during that time had the Chairman absented himself from the meetings. It was really deplorable, with such facts and clear explanations before them, that shareholders did not place more confident reliance in their directorial guides; and it was most unwise and damaging to reject their measure for raising money by debentures, and to defer the meeting in opposition to them. He had now in reserve for the approval of the shareholders a scheme to release the Company from further costs of demurrage and to ensure a reliable supply of coal, which was of vital importance to their success. They had now an opportunity of purchasing a piece of land on the waterside, on which they could erect a wharf and landing-pier for the coal. The cost would be very small, compared with the present expenses of their coal supply, besides which it would save them from the possibility of fines through failing to maintain a proper supply of gas.

Mr. FALK said that, in the accounts, they had an item of £38,165 representing coal, material, &c., in San Paulo, Santos, and in transit, besides cash advanced to agents at Santos for balance of freights, &c., and shipment lost, which made £47,072. He should like to know how much of this represented coal and how much other materials. He also asked what was the cost of coal in England, and the freightage? He was one of the originators of the Company in San Paulo; and consequently he knew precisely what was required there. He also inquired what was the quantity of coal carbonized per month; what was the storeage capacity of the hulks at Santos; what railway arrangements the Company had for the transport of their material from Santos to San Paulo; and what interest they obtained on their cash in London and in San Paulo. The Directors were asking for permission to borrow the large sum of £50,000 (which was very nearly the original capital of the Company), at 7 per cent. interest. He could not see why a Company which had a capital of a quarter of a million sterling, and had paid 10 per cent. for twelve years, should be so hardly set that they should offer to pay 7 per cent. for money. He further asked what was the amount of the management expenses in London.

The MANAGING-DIRECTOR (Mr. J. Heath), in reply, said that of the £38,165 referred to, £14,908 was for coal, and £23,257 for materials, partly at San Paulo and partly at Santos. The figure named represented 8298 tons of common gas coal and 1710 tons of cannel. The

former cost about 9s. per ton in England; and the freightage to Santos was 30s. This, however, did not cover all the charges—demurrage, among other things, having cost them as much as 30s. per ton. The coal was then only landed on the quay; and it had to be conveyed to San Paulo. The consumption of coal averaged about 200 tons per week, of which one-third was cannel, and two-thirds common coal. The capacity of the two hulks at Santos was 1000 tons each. They had not a contract with the San Paulo Railway Company to take the coal and material from Santos; and their charges, he believed, averaged 5s. per ton. As to money on deposit, he thought the interest in London was now 1 per cent.; while the ruling rate at San Paulo was 2½ or 3 per cent. The Directors were paid £1000 a year; and the management of the London office, including rent, was £700.

Mr. JONES commented at some length on the great increase in the amount of depreciation now written off as compared with 1885-7. But it was shown by Mr. Heath that the figures he quoted referred to the depreciation in the book debts and cash balances in San Paulo; and the variation was due to the great fall in exchange, and that therefore the depreciation was an item which could not be controlled by the Directors. Remarking upon the proposed purchase of land, Mr. Jones said he could not see that it would get the coal any quicker from Santos to San Paulo. The San Paulo Railway was the cause of their difficulty in this respect; and it had incurred very great displeasure in Brazil. Notwithstanding this, the Directors of the San Paulo Gas Company had appointed two gentlemen connected with that railway to assist in the management of the business. With regard to the working capital, in his opinion the Directors ought to have more; and he mentioned that he had suggested to them that they should at present issue only £25,000.

Dr. BATT made a brief explanation with regard to the circumstances attending the appointment of the two Directors alluded to by Mr. Jones (Messrs. Fox and Hillier). Neither the Chairman nor himself at that time was personally acquainted with these gentlemen; but they were aware that they had a great knowledge of the affairs of San Paulo, and the experience they possessed, it was believed, could be of considerable advantage to the Company. Their appointment, it would be remembered, was endorsed by the shareholders.

Mr. FOX pointed out that, on his election as a member of the Board, Mr. Jones referred to him as being the "right man in the right place," and bore testimony to the good work he had done in the early days of the Company. It was through him that the concession was saved from lapsing; and the land was bought under his advice. He did not think that, when he was asked to join the Board, it was simply because he was Consulting Engineer of the San Paulo Railway Company; and he was not there to defend the action of that Company, or to take its part in any way. As to the Railway Company entering into a contract with them for the carriage of the coal, they would not be allowed to do so. The coal and other material had to be drawn up an incline of 2500 feet; and the Railway Company only charged them at the rate of ½d. per mile. He supposed the scheme proposed by the Directors would cost between £5000 and £6000; but there would be a considerable saving in demurrage, which would soon recoup that amount.

In the course of further discussion, the CHAIRMAN pointed out that it was imperative the Company should have further working capital; and several shareholders appeared to be in favour of giving the Directors authority to raise half the amount asked for in the resolution.

The SOLICITOR then suggested that, by amending the resolution as follows, the difficulty might be overcome: "That the Directors be, and they are hereby authorized to create and issue debentures providing for the payment of principal sums, not exceeding in the whole £50,000, with interest not exceeding the rate of 7 per cent. per annum, such debentures to be in such form, and to be secured in such manner, and to be issued to such persons, and on such terms (not less than par) as the Directors may think expedient, subject to the condition that no debentures in excess of £25,000 be issued without the sanction of a special meeting."

Mr. FOWLER having made some remarks in which he strongly complained of the insufficiency of the information supplied to the shareholders,

The resolution in its altered form was passed *nem. con.*; and the proceedings then terminated.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Gas Committee's Report—The Price of Gas and the Coal Contracts.

At the Meeting of the Birmingham City Council last Tuesday—the MAYOR (Mr. Lawley Parker) presiding—the report of the Gas Committee, of which the principal portions were published last week, was submitted.

Alderman POLLACK proposed the adoption of the report; and, in doing so, he first referred to the purchase of the Sutton Coldfield gas undertaking. He said he considered the transfer would prove a blessing, he might almost say, to everybody. It would be of advantage to the Corporation of Sutton Coldfield, because it was not possible to make the supply, restricted to a locality like Sutton, remunerative; and it would also be an advantage, inasmuch as the supply would be cheaper than formerly. Probably the Council would have seen with surprise that there had been a decrease in the consumption of gas during the quarter ending in June last; but this was easy of explanation. In the corresponding quarter of last year, there was an abnormally high increase in the consumption of gas over the quarter of 1890. It was as much as 16 per cent. If they took the 7¼ per cent. deficiency during this year from the 16 per cent., it left them with an increase of 8¾ per cent., or an average for the two years of rather more than 4 per cent., which was the normal consumption of gas in Birmingham. The Committee found it increasingly difficult to dispose of coke; but he was pleased to be able to say that contracts were now in progress, which he hoped would prevent such a large accumulation of stock as they had last year. Of course, some stocking of the coke was absolutely necessary. As to the contracts for coal and tar, he remarked that the question of raising the price of gas depended on these; but as they had now been made, he need hardly assure the Council that the Committee had used every endeavour to make them as favourable as possible. The result, however, had proved not of an entirely satisfactory nature. The tar products had been decreasing steadily during the last twelve months; and at the time when they had to fix the price of tar for the present financial year, the products had fallen nearly 50 per cent. as compared with the preceding twelve months. In these circumstances, they were met very handsomely by Messrs. Lewis Demuth and Co., Limited, who were the contractors; and although they had made to the Committee some considerable concessions, yet the revenue from tar would show a large falling off at the end of the present financial year. With respect to the coal contracts, the Committee were met with a very strong combination of coalowners, whose object was to maintain the price of coal which they charged in the previous year, although the state of the market by no means warranted it. The annual consumption of coal was at present 450,000 tons; and the quantity of coal offered to them by the owners was about 850,000 tons. This proved conclusively that the high price demanded was not due to any dearth of coal in the market. It was very painful to the Committee to pass over some firms with whom they had been connected for many years; but they would have been remiss in their duty to the Council had they yielded to what they considered extortionate demands, which they in vain endeavoured to modify. Had they yielded to these demands, the Committee would have had to recommend to the Council an increase in the price of gas. But, instead of reverting to that very easy expedient to get out of their difficulties, they were determined to purchase coal at the lower price from new sources. Of the financial results, it was impossible for him to speak at the present moment, or to say whether it would or would not be necessary to increase the price of gas. They knew there was likely to be, and there must be, an increase in the price charged for water; and they felt that, to increase the price of gas, would be an additional taxation which would fall heavily especially upon the large shopkeepers and manufacturers, who consumed gas at a time when trade was by no means flourishing. The Committee had also made very strenuous, and, he might say, successful efforts to stimulate the consumption of gas for heating and cooking purposes, and for motive power. There was also good hope for believing that next year the present high and artificial price of coal would not be maintained; and the Committee felt that, if they could tide over this year, they would henceforth be able to make both ends meet and yet charge the present price for gas. They trusted the Council would approve their policy in not following other gas undertakings in the country in advancing the price of gas. What John Bright said when he was told that war must come sooner or later, he (Alderman Pollack) said as to the increase in the price of gas, "The later the better."

The resolution was seconded and carried without discussion.

THE EXTENSIONS AT THE STAFFORD CORPORATION GAS-WORKS.

A Municipal Visit to the Works.

By invitation of the Gas Committee of the Stafford Corporation, a number of members of the Town Council recently visited the gas-works, for the purpose of inspecting the alterations and additions which have lately been made or are now in progress, under the supervision of the Gas Engineer (Mr. J. Ferguson Bell, Assoc.M.Inst.C.E.).

The visitors having assembled in the Committee-room, the Chairman of the Gas Committee (Mr. Alderman W. H. Peach) explained the object of the gathering. He then went on to say that, in order to appreciate what they had done at the gas-works, it would be necessary for him to go back perhaps as far as the commencement of his connection with the Committee, and that was something like nine years since. At that time, certain alterations were being made in the establishment; but they were more with respect to the *personnel*, whereas the present ones were in the *matériel* of the department. During this period the works had prospered much more than could have been expected, and more than they possibly could have done under less able management than that of their esteemed Engineer. In 1884, the time to which he referred, the gas made at the works amounted to 74¾ million cubic feet; in 1892 the quantity produced was 120 millions, which was an increase of 61 per cent. So they would see that it was absolutely necessary to extend the works, if they were to do the business. In 1884 there were 1982 consumers; in 1892 there were 2856—being an increase of 50 per cent. Many of these were small consumers on the fortnightly system, and would not account for the increase of 60 per cent.; but they had in addition 140 gas-fires and 329 cooking-stoves on hire, while, including those which had been sold, there were more than 500 in use in the town, and there were 24 gas-engines, with a total of 300-horse power. These would account to a great extent for the large increase which had been experienced. As consumers were encouraged by the reduction in the price, they might hope that in the near future there would be further development from the use of gas-engines. It might interest those present to know that the revenue from these sources alone was more than £2000 per annum. In 1884 the price of gas was 3s. 4d. per 1000 cubic feet net, with meter-rents; the price was now 2s. 3d. to 2s. 9d. net, without meter-rents. As the latter amounted to about 1½d. per 1000 cubic feet, the reduction in nine years was about 1s. per 1000 feet, or something like £4000 per annum in the gross, besides the £2000 annually paid for the reduction of the rates. What this actually meant to the town he could illustrate best by reference to the district rate. A penny per 1000 feet to a large consumer was equal to 8d. or 9d. in the pound on the rateable value. He spoke, not from conjecture, but from his own experience. To a small consumer it was equal to a little more than 2d. in the pound. So that had the gas remained at the old price, they would have been paying for it a sum equal to 2s. in the pound on the district rate on dwelling-houses, and between 8s. and 9s., if not more, for manufactories; and this would be a serious item indeed to a manufacturing town like Stafford. The importance of the works to the town might also be gauged by the fact that the annual wages account came to very nearly £5000. The total income from all sources was now £22,000; and the

gross profits amounted to about £7000. The invested capital, including the £15,000 for which they had recently obtained sanction was £100,000. They had repaid £17,500; leaving a capital of £82,500. In 1884 the amount was upwards of £80,000. So that, although they had extended the works, they owed very little more. In point of fact, they lately owed £5000 less; but when this sum had been borrowed, they would owe practically the same as they did nine years ago, while they could show all the improvements the visitors would see shortly. The alterations and extensions might be divided into two classes—those they had paid for out of revenue, and those they had paid for out of capital. Those paid for out of revenue were first of all represented by the improved lighting which had taken place in all the main thoroughfares, the cost of which might be estimated at about £300. In 1886 they put down two large new purifiers, which cost £1500, and were still in use. In 1887, they would remember, there was a very serious fall in the price of ammoniacal liquor. Mr. Bell, in order to face the difficulty, went into the question of the manufacture of sulphate of ammonia; and they erected sulphate plant, which had proved to be an excellent investment. It cost £1000; but it paid for itself in a short time, and was still yielding excellent results. Then they turned their attention to providing new offices, which cost £600; and new workshops were erected, on the site of the old coal-stores, in the place of the miserable shanties which formerly existed. The workshops were in the highest state of efficiency; while the comfort and the convenience of the workmen had not been lost sight of. These cost another £1000. These, with other minor alterations, made a sum of about £5000 paid for improvements entirely out of revenue. The more expensive extensions had, of course, been provided out of capital, for which the new loan was recently issued. First, he thought, in importance, was the railway siding. For something like twelve years during the time of his two predecessors, negotiations took place with the Great Northern Company, with a view to getting a siding to the works, and at last—thanks, he thought, to Mr. Bell more than to anybody else—the siding was an accomplished fact. The rails extended for about half a mile across the meadows and about a quarter of a mile in the works; and the importance of this connection to a gas-works could not be over-estimated. It represented an actual saving annually of £500; and as the business was increasing, of course the saving to the Gas Department was increasing in the same ratio. If at any time the Corporation should establish works for the production of electricity, the siding would be still more profitable to them. He ought also to mention the bridge, the construction of which was a difficult piece of work. Some of those present remembered the disastrous experience of the Corporation in building the Victoria Bridge. Now, though they had the same river to cross, with a different engineer their bridge had been completed without the slightest hitch or accident, and reflected the highest credit on the engineering ability of Mr. Bell. With regard to the coal-stores, they had built two large and convenient stores in contiguity to the retort-house. It was a great advantage to them, as well as to the colliery-owners and the colliers, that they were able to store coal in the summer, as they obtained it at 3d. per ton less than in the winter; while it found the colliery workers something to do when work was slack. It was also a consideration that they would not be in the remotest danger of running short of coal, as they were on one or two occasions last winter. With respect to the new retort-house, he could only describe it as a grand house. By the adoption of Mr. Bell's patent regenerative furnaces and mouthpieces, a great saving was effected; while the stage floor would enable the stokers to work in something like comfort, compared with what they were doing in the old retort-house. Another improvement had been the telescoping of the gasholder. They were very nearly running short of gas on several occasions last winter; but with their increased producing and storage power, there was now no danger of that. A new scrubber of the most approved kind had also been erected, and did more satisfactorily the work which four scrubbers used to do. Lastly, he had to mention the purifying plant, which was on the latest and most approved principle, and when finished, and the old purifiers, which they had decided to keep, were re-fixed, they would have gas as absolutely pure as it was possible to make. The works would then be such as they would be proud of, and as complete as any in the kingdom. After the wall, which was already sanctioned, had been finished, the only thing required to make the Gas Department quite perfect would be the erection of a tar-distilling plant, which the low price of tar might make them see their way to do before long.

The visitors were then conducted over the works by Mr. Bell, and witnessed the various processes in connection with the manufacture of gas and the utilization of the residual products. The programme included a descent into one of the gasholders at present out of use. The new retort-house, so highly spoken of by the Chairman of the Gas Committee, came in for a large share of attention. The methods of measuring and testing the gas were illustrated and explained. A great deal of interest appeared to be taken in the visit; and it may well be supposed that the members of the Council were duly impressed with a sense of their responsibilities for the conduct of an enterprise of such magnitude.

THE SMOKE NUISANCE AT THE COVENTRY CORPORATION GAS-WORKS.

The inhabitants of houses in the neighbourhood of the Coventry Corporation Gas-Works have again caused complaint to be made in the Council of the "dense volumes of smoke" emitted therefrom. At the last meeting of that body, Dr. Fowler introduced a resolution, requesting the Gas Committee to take into consideration the best means of diminishing the nuisance, and to report to the Council. The householders near the works, he remarked, were aware that there must be some smoke; but they did think that, after more consideration, the Committee would be able to diminish it, and so deliver them from the plague of darkness with which they were now troubled. It was true that the gas-works were there first, and that the houses were erected around them; but the works were not then constituted as they were ow. Since the new retort-house had been built, and other alterations made, the nuisance was greater than before. The inhabitants had asked him to present a petition signed by upwards of 200 persons, complaining of the nuisance, and asking the Council to do what they could to remedy it. The proposition having been seconded, Mr. Drinkwater said he was quite certain that the people were not crying out without cause. The smoke and dirt had been much worse during the last three or four months; and, as a member of the Gas Committee, he could say that they had frequently had the matter under consideration. His opinion was that they should send the smoke higher into the air, instead of letting it envelop and enter people's homes. Alderman Banks observed that he recollected some years ago, when the works were in the hands of the old Company, that the Town Clerk was instructed to write calling their attention to the nuisance. But now the guardians of the public health—the Corporation—had become possessed of the works, it was different, and all these things were borne as calmly as possible month after month. Mr. Haywood said the Gas Committee were fully alive to the fact that there was a greater amount of smoke since the new retorts had been put in. Being new, they were not thoroughly understood at first; but now the smoke and sulphur had been considerably reduced. Their Manager (Mr. G. Winstanley) was ever on the alert to see what could be done; and he had instructions from the Committee to spare neither time nor expense to mitigate the evil. Mr. Wormell thought that, if the nuisance in the manufacture could not be lessened, the question of removing the works from the city would have to be considered. Mr. Calcott was of opinion that the nuisance was increased by the new system of charging the retorts. The memorial already referred to having been read, the Chairman of the Committee (Mr. Andrews) observed that he did not know what the memorialists meant by "removing" the nuisance. If they meant that the Council must remove the whole of the smoke, they asked for an impossibility. There was always more or less smoke connected with the manufacture of gas; and there would be smoke so long as gas was made on the present system. All they could do would be to bring the volume down to a minimum. He did not know of any gas-works where there was no smoke—indeed, at some works more smoke was emitted than at Coventry. The Gas Committee fully sympathized with the prayer of the memorialists; and they would do all they could to obviate the evil. With regard to the inclined retorts, there was rather more smoke at first than the Committee cared to see, and more than they expected. The retorts were new; and the method of working was fresh to the men. Within the last three weeks, however, this difficulty had been overcome; and there was now a great deal less smoke than before—indeed, he did not think there was any more smoke from the inclined retorts than from the horizontal ones. There could be no objection to the memorial being referred to the Gas Committee; but, on the other hand, he did not see what they could do more than had already been done. With regard to removing the manufacture of gas from the city, the Council might take it for granted that Parliament would not sanction an expenditure of such a large amount of money for the convenience of a few people living in the neighbourhood of the gas-works. Dr. Fowler, in replying on the debate, said he regretted the question of the removal of the gas-works had been mixed up in any way with his resolution. Mr. Andrews had asked what was meant by removing the nuisance. They meant that the smoke should be reduced to a minimum; and they sincerely hoped the Gas Committee would endeavour to do something further in this direction. The proposition was then carried.

THE PRICE OF GAS AT PRESTON.

Considerable feeling, writes a local correspondent, is being imported into the agitation already alluded to in the JOURNAL, against the action of the Preston Gas Company in giving notice of an advance of 4d. per 1000 cubic feet in the price of gas. Last night the consumers were to have a public meeting called by the Mayor to protest against the course taken by the Company; while during the past week or two the subject has been discussed with a good deal of vehemence at other meetings and in the local press. The Walton-le-Dale Local Board contributed its quota to the agitation by passing a resolution protesting against the advance. Consumers in that district pay a differential rate. According to the Chairman of the Local Board, this used to be 10d. per 1000 cubic feet, and millowners were glad to get the supply at that figure. But now it has been reduced to 5d.; so that one-half of the extra price which the consumers had to pay for the laying of the mains to their district has ceased. Another meeting held last Friday night in Preston was composed of owners and users of gas-engines. Their chief contention was that, whatever the price charged to ordinary consumers, a reduction therefrom should be made to those who use gas as motive power. It was pointed out that, in other towns, day consumption was encouraged by a reduction of the price to users for heating, motive power, and cooking; but in Preston the only abatement was that made to very large consumers such as millowners. The meeting candidly recognized that it was of no use for owners of gas-engines to threaten to boycott the Company, and say they would either have the gas at a reduced price or they would not have it at all. It was, however, decided to send a deputation to the Manager of the Company, and place the views of the local owners of gas-engines before him. What course of action may be taken as the result of the public meeting it is useless to prophesy. The Company's case is that the increased price is necessitated by the decline in the income for residuals. Those who take a prominent part in the agitation talk, in a strain familiar enough, of "bloated capitalists," of the way in which consumers are "robbed," and so on. One great grievance against the Company is that it obtained powers to raise a considerable amount of capital before the auction clauses and sliding scale were introduced. Another is that an attempt by the Corporation to acquire the undertaking in 1873 failed; and there are not wanting those who would like to see this attempt renewed, and, if possible, carried to a successful issue. It is needless to say that none of these people ever give the least thought to the new investors in the Company's stock. The Company are, of course, paying no more than the statutory dividends, while some of their stock has, it is said, fetched as high a price as £250 per £100, at which it certainly cannot yield a high dividend.

THE METROPOLITAN WATER SUPPLY COMMISSION.

Wednesday, Oct. 5.

(*Lord* BALFOUR OF BURLEIGH, *Chairman*; *Sir* G. B. BRUCE, *Sir* A. GEIKIE, *Professor* DEWAR, *Dr.* W. OGLE, *Mr.* G. H. HILL, *and Mr.* J. MANSERGH, *Commissioners.*)

To-day the above-named Commissioners resumed their investigation—adjourned from the 27th of July last (see *ante*, p. 356)—into the question of the Water Supply of the Metropolis. It was the seventeenth day of the inquiry; and it was devoted to the hearing of engineering evidence.

Mr. *T. Hawksley*, M.Inst.C.E., F.R.S., was the first witness called.

The CHAIRMAN said he did not think it was necessary to go through what Mr. Hawksley had done in connection with water-works, as he was a well-known authority thereon; but, from the statement he had laid before the Commission, he understood that the witness estimated that, so far as the Thames watershed was concerned, embracing an area of 3676 square miles, it was fair to calculate that 6 inches of rainfall would be the minimum annual yield.

Witness said that in the driest years this was the quantity available; and, translated into millions of gallons, it would give an average for the year of 877,000,000 gallons over Teddington Weir. He took it that the object of the Commission was to ascertain how much water the Companies might take, even at the end of 50 years. According to Mr. Binnie's very exaggerated views, allowing 200,000,000 gallons to pass over Teddington Weir, and leaving the Companies with upwards of 300,000,000 gallons a day, they could deal with 500,000,000 gallons in the Thames area. From the Thames certainly no more water was required than 25 gallons per head per day for 6,000,000 people; and this would carry them forward for the next 25 years. At the present time, rather more than 4,000,000 people were supplied from the Thames, and about 2,500,000 from the Lea with the aid of the Thames. The reason he took 25 gallons per head was that his extensive experience showed that, with the best management, not more than 20 gallons per head were used for domestic consumption and for ordinary trade purposes; but, in order to be quite safe, he had increased it to 25 gallons for the purposes of the Commission.

The CHAIRMAN: You are aware, I suppose, that, if the present estimate of population is correct all over the Metropolitan area, and the Companies' statement of what they supply is accurate, it amounts now to a little more than 32½ gallons per head per day?

Witness said that was so. The Companies did not at present take any care of the interior of the houses; and the consequence was that there was very great waste. In the best-managed towns, the quantity never exceeded 25 gallons per head, and rarely went beyond 20 gallons. Leicester, with 200,000 people within the limits of the water supply, one third of the water being used for trade purposes, was supplied on the constant system at high pressure with 18 gallons. The same thing occurred at Norwich, and in a considerable number of other towns where there was the best management. The intermediate management—not of the best kind—caused a consumption of from 22 or 23 to 25 gallons; and where there was negligent management, as there was in the Metropolis, it might go up to 30, and more than 30 gallons.

Your calculation is based, then, upon much more strict control of the consumption than exists at the present time?—Not strict, but reasonably careful. The circumstances of London differ very much from those of towns newly supplied; and there is no system of inspection of fittings. But with proper inspection once every half year, there would be no difficulty in bringing the consumption within 25 gallons per head, though it would require time. I have taken water into my house for 40 years, and have never had a visit from an inspector.

Your plan for supplementing the supply of London, so far as it requires to be supplemented, is by means of storeage reservoirs in the upper tributaries of the Thames?—That is one way. Another is to make storeage reservoirs in the lower part of the Thames. Of these, other gentlemen will speak who had devised those reservoirs, of which I entirely approve.

In your statement you say that the Engineers consulted by the Thames Conservators have found eligible storeage-grounds for 20,000,000,000 gallons of water; and others consulted by the Grand Junction Water Company have planned storeage works for 18,000,000,000 gallons. You have gone into that matter, and found them adequate to their objects; but they do not exhaust the capabilities of the river?—That is so, with this observation—that I am not quite sure whether in one or two cases the ground is so entirely eligible as those gentlemen think. It must be made water-tight, as a matter of course.

In further examination, witness said that above Woodstock there was some doubt as to whether the ground was quite suitable; but they could move to other places which were. There were plenty of places in the valley of the Thames; and he had been to one, a few miles above Oxford, which would supply the whole quantity almost alone. Mr. Etheridge, who had gone into the matter very minutely as a geologist, would describe the strata. He (witness) might further observe that if he had the management of the undertaking he should pump into the reservoirs, from the Thames, enough water to keep it fresh and in its best condition. To that there could be no objection, other than that of causing some slight expense. In the gauging returns for 1884, they would find that it was necessary to take water for about four months together, with 15 days to meet the wishes of General Scott with regard to possible floods. He had gone carefully into that question, with this result—that if these reservoirs contained 17,368,000,000 gallons, they would supply settled water (and he wished to emphasize the word "settled") for 168 days, which was the longest period for which any necessity arose. This was upon the supposition that a flood immediately followed the short-water period; and he had added the 15 days to meet General Scott's views, which he did not share. This was the very worst that could happen. He would get from the Thames the water to fill the storeage reservoirs, when the river was delivering more than the 300,000,000 gallons the Companies wanted. Instead of the lowest day's yield, the average of the lowest week's yield should be taken, because the water came down irregularly in the dry seasons, in consequence of the mills shutting down on Sunday, and accumulating water in their ponds to be used on subsequent days. Other irregularities were produced by the rise of locks, and by the use of shuttles on the weirs. If they took the week's flow in the lowest seasons, and divided it by seven, and deducted it from 200,000,000 gallons, they would find the quantity which the reservoirs would have to send into the Thames to make up the deficiency at Teddington, together with the 300,000,000 gallons which was supposed (but with which he did not agree) to be the demand upon the Thames 50 years hence. The cost of these reservoirs had been estimated at £4,000,000 or £5,000,000.

The CHAIRMAN: With regard to the Lea Valley, after stating the number of square miles, the acreage of the area, and the yield in the driest year at 4 inches, you calculate a natural yield of 80,000,000 gallons a day, from which must be deducted 5,000,000 gallons for navigation. It is not quite clear whether that 80,000,000 gallons is from the river alone, or whether you intend it to include the springs as well.

Witness: The 80,000,000 gallons are made up in this way: In August, 1887, the river yielded the smallest quantity, and at that time the New River Company took 22,400,000 gallons a day, and the East London Company 28,000,000 gallons. Then there was pumped by the former Company this year, from the same area, 13,200,000 gallons; and the latter Company pumped 2,800,000 gallons. This was all from wells in excess of what was taken from the stream. Therefore the watershed gave them 66,000,000 gallons a day. The New River Company believed (and Mr. Francis, their Engineer, is my authority for that) that they could get a further quantity by pumping 21,000,000 gallons a day; and the East London Company, according to the view of their Engineer, Mr. Bryan, in which I agree, thought they could get about 3,000,000 gallons a day more—the two together make up 24,000,000 gallons. This brought up the total to 90,000,000 gallons without storeage reservoirs. They could easily get 10,000,000 gallons more by making reservoirs, to be filled during the wet years, in the usual way of supplying towns by gravitation. Adding these would make a total of 100,000,000 gallons. But it is possible Mr. Francis might have overrated his future gain by sinking wells; and I therefore took off 10,000,000 gallons, which would reduce the capability of the Lea to about 90,000,000 gallons per day. Then the East London Company have the power to take 10,000,000 gallons from the Thames. What can be obtained from the wells and springs is the quantity of water over the chalk, which is merely a cistern; and the water brought over into that cistern in wet years would be available during the following dry years.

Do I understand you to mean that the springs and wells will replenish themselves in the wet years, and be a natural source of supply in the dry years?—Yes, those springs and wells not being waters which reach the river in the dry years, but require to be made use of by artificial means, by pumps. The 80,000,000 gallons are represented by 4 inches of rainfall over 500 miles of watershed, which is the calculation of what the river would yield in dry years without anything from the springs.

You wish to refer, I believe, to what you describe as the prevalent exaggerations with respect to alleged river pollution?—Yes. I have gone very carefully into that. You are told that, if there is a case of cholera at Oxford, the whole of the Metropolis will be decimated. My experience is very great with regard to river supplies; and such things do not happen. But the rivers have self-purifying powers by an oxidizing process; and nothing that is offensive that happens to be put into a great river, in small amounts, will ever reach the lower portions. You have analyses made by both friends and enemies of the Water Companies, all telling you the same story—that organic carbon and organic nitrogen, and other things upon which chemists are in the habit of dwelling, are very small; and beyond this you have the investigations and reports of Dr. Swain Taylor upon that very subject. More important still, you have the returns of the Registrar-General, showing that the Metropolis is the healthiest city in Europe.

In your statement, you make a calculation showing that the populations of the river areas are exceedingly sparse; being about one person to 2½ acres, while in England generally there is one person to about an acre?—Yes; that is so.

I will make a suggestion to you about that, and I ask you to criticize it—that the population along the Thames valley is not evenly distributed; that it is congregated rather upon the streams than upon the uplands; and that therefore it is a fallacy to compare it with the population of England generally of about one person to an acre. I ask you whether that in any way affects your view on the matter?—Not in the least; and more especially because all these denser populations have sewage farms, precipitation works, and other things established for the prevention of noxious matter entering the river.

Not quite all of them. Staines, for example.—Staines has only 5000 people in it; and I suppose not more than 1000 of them contribute anything to the river. I am intimately acquainted with Staines, having acted for the Local Authorities on this very subject.

One report upon Staines is that there is considerable direct sewage and slop pollution and drainage from two breweries and a linoleum factory discharged partly into the Thames, and partly into branches of the Colne which join that river; and the Thames Conservancy say that the ground in various places was opened in 1889 and 1890, and several drains, &c., were discovered which polluted the Thames, the Colne, and ditches. There has been an improvement since then—some of those drains having been diverted; and notices having been served in 21 cases. But even if that is so, do I understand you to put before us that this is so infinitesimal a thing that no attention should be paid to it?—No; attention ought to be paid to it. But, for all that, it is infinitesimal. There is not even discolouration within 50 yards of the outfall; and this shows that it is infinitesimal in volume when compared with the Thames.

You say that very little obnoxious matter is received into the rivers. I should like you to give me some definition of what you consider and what you do not consider obnoxious?—Well, I should say fæcal matter is obnoxious; and I should also say that some kinds of manufacturing water are obnoxious, but not all. In the case of Staines, the volume of water entering into the Thames when I measured the largest source of pollution was only 80 gallons per minute. That was chiefly from the breweries; and, of course, it would be less in the night, when the breweries are not at work.

In further reply to the CHAIRMAN, who reminded the witness that he had stated that he had had a large professional experience of epidemics of Asiatic cholera, and that he would give the Commission some interesting information on the subject, he affirmed that the water supply of the Metropolis had never occasioned any epidemic of cholera. He did not mean to say that this disease could not be communicated by water, for it could, when the water was highly polluted, and had no means of being purified by natural oxidation. It was a remarkable fact, however, that cholera usually went up rivers.

The CHAIRMAN: But you do not dispute the general statement that impure water, under certain circumstances, is a fertile source of the propagation of cholera?

Witness: A source; I will not say a fertile source.

Witness's attention was next directed to his statement that he had had very extensive experience in the use of filter-beds, and had promised to give the Commission some explanation of their action, which was at present imperfectly understood. He pointed out that filter-beds were supposed to act merely as sieves; that was to say, they sifted out any appreciable particles which were passing through, but had no effect upon colouring matter or very minute particles. This, however, was not the fact. The truth of the matter was that filters acted for the abstraction of the particles by what he might call the principle of universal attraction, which was the same as gravitation. Bodies attracted each other; and if one particle was brought within a certain distance of another, they would get together by mutual attraction. This was the way that the passage of the particles of sand acted upon the colouring matter floating in the filters, and upon the minute particles which were smaller than the apertures between the particles of sand. They would all go through, from the top of the filter-bed to the bottom, if it were not for the attraction of the sand particles for the other bodies. These attached themselves to the sand; and the water was purified in that way to a much greater extent than by the mere sifting process.

In reply to Sir G. B. BRUCE, witness remarked that the total contents of the reservoirs which he would construct in different parts of the Thames Valley, or those of the tributaries of the Thames, would be 17,368,000,000 gallons. He mentioned that the Vyrnwy reservoir, in the construction of which he was concerned, contained, he believed, 13,000,000,000 gallons; but of this quantity only about 10,000,000,000 or 11,000,000,000 gallons were available. The reservoirs which he proposed should not be all made at once, but only as occasion required.

Sir G. B. BRUCE: And in proposing these reservoirs, I suppose you have taken into consideration the difficulty of constructing them where there is much pervious material in the ground.

Witness: The strata are quite impervious; they consist of London clay.

Then you suggest that the water of the reservoirs should be kept fresh by pumping the water out of the Thames into them, to prevent its becoming stagnant, I presume?—I do not propose that any water should lie there unchanged for several months. I suggest that water, when the Thames is in its very best condition, shall be pumped into the reservoirs in sufficient bulk to keep the water perfectly fresh; but not in the quantity in which it is taken out. A reservoir would be of no value if it were kept constantly filled. Less water would be pumped in than was taken out; still, it would be pumped in in sufficient quantity to keep the water fresh.

Witness was reminded that he had suggested that, in some cases, a certain proportion of the additional water would be furnished by wells; and he was asked if he had considered the objection which was raised to this, through interfering with the natural flow of water in the streams and rivers. In reply, he said he had not, because he supposed that, when they made storeage reservoirs, they would provide the proper quantity of compensation water to be given out. Reverting to the question of discoloration, witness mentioned that he had been taking the water of the London Companies for more than 50 years, and had scarcely ever had an instance of discoloration in his house. When it had occurred, it was best observed in a bath, because it was so slight that they could not see it except in a large bulk of water; and then it was not mischievous—it was very slight compared with the discolorations which occurred in the water of almost all towns supplied by gravitation. If they went to Manchester, they would find that in the hotels tinted glasses and decanters were being used, in order to prevent the colour of the water being noticed. In Glasgow the water was brown, owing to peat on the hills. This occurred in all places where the drainage area consisted largely of peat.

Mr. HILL: Of course, you cannot by filtration remove the stain?

Witness: You cannot remove it very largely; but by the operation I have mentioned, and also probably by some oxidation——

Oh, yes; by exposure of a large surface, the water does lose some of its colour?—The water bleaches.

Mr. HILL called the attention of the witness to the question of the population of the Metropolis, and inquired if he had observed the increase that was going on.

Witness stated that he had had a great deal to do with the ratios of increase, not only in the Metropolis but in all the large towns in the kingdom where he had been concerned.

But it has been much larger in the Metropolis since the report of the Duke of Richmond's Commission than was expected would be the case when the evidence was taken upon which that report was based?—I do not know what was expected. It has been going on numerically faster than before.

Then, as regards the storeage of the water from the Thames, are you satisfied that the water which would be taken into the storeage reservoirs would be good?—Yes; it would be exceedingly wholesome—water exclusive of flood water.

Then you do not intend to fill these reservoirs with the flood water of the Thames?—The flood water is to be wholly excluded. The hypothetical quantity spoken of is to be drawn from the reservoirs without any admixture of flood water. The reservoir water is exclusive of flood water, and that water would be brought down by pipes to the pumping-stations of the Companies, unless they choose to move their stations up to the reservoirs, which they might do. No flood water would be sent into London.

That is to say, the water you would store in these reservoirs would not really be the sweepings-out of the drainage area when floods come on?—Oh, no.

Asked if he attached much importance to the turning of the effluents from all the different places into the River Thames, witness observed that, if the effluents were sufficiently purified, there was no reason why they should not go into the Thames, to be taken out afterwards for domestic purposes, subject to natural purification and good filtration. He looked upon the Thames watershed as being an entirely suitable one from which to supply a town, provided there was proper inspection of all the sources of pollution of the whole drainage area, and the water received was properly filtered.

Requested to give his opinion as to the effect, looking to the future, of the abstraction of large quantities of water from the chalk upon the surface streams, witness replied that the streams would continue, but not in the same volume. All the rain water did not go down to the chalk. Some remained on the surface, while some percolated to the chalk, to be afterwards pumped up. If a large demand were made on the chalk, it might affect the surface streams to some slight extent; but the streams would be maintained.

Professor DEWAR re-directed witness's attention to what he had said concerning the action of sand filters in removing particles much smaller than the area of the spaces between the grains of sand, and asked him if he knew of any case where a water supply treated by sand filtration, properly conducted, had ever led to an epidemic.

Witness: I do not know of any such case.

I understand you to say that, personally, you know of no case where, after proper sand filtration, applied even to a polluted water—a water previously polluted to some extent with sewage matter—led to an epidemic?—No. But you use the word "polluted." Water-works are not made on polluted streams; and therefore the waters which are filtered for distribution are not, in the ordinary sense—in the philosophical sense they may be—polluted to begin with.

Professor DEWAR, so that there might not be any difference of opinion on the point, modified his question, not using the word "pollution."

Witness repeated that he knew of no case where a water supply derived from a river flowing through populous districts had, after filtration, been the cause of an epidemic. But he added, with regard to filtration, that it might be good, imperfect, and in some cases bad. In reply to further questions, he said he was satisfied with the mode in which water at present supplied to London was filtered; but he had not been over the works for the purpose of criticizing. He had no special information, except that which he had obtained from reports in which the filtering areas were given; and if the areas were in use to a sufficient extent, the water he thought must be well purified.

In reply to Sir A. GEIKIE witness repeated an opinion that there was more water to be obtained by pumping from the basin of the Lea than from that of the Thames, because proportionately there was a much larger extent of impervious strata in the Thames district than in that of the Lea. Going back to another point—that of storeage reservoirs up the valley of the Thames—he affirmed that there would be no difficulty in finding sites for the reservoirs where there was no pervious material below, or where, at all events, it could be got rid of. He was aware that up the valley of the Thames there were large quantities of what was called "drift;" but they would have to pass through this with their puddle wall. This was not difficult at all; but it was a cause of expense.

Asked by the CHAIRMAN if he had anything further to say, witness mentioned that he had taken out the death-rates for all the towns that were reported upon in the returns of the Registrar-General, where they were supplied with soft water and where they used hard water—and the latter towns showed a death-rate 14 per cent. lower than the former. This was very much in accordance with reason, because hard water contained a certain quantity of lime; and this was very essential to the human system. There was no other point.

Sir *F. Bramwell*, M.Inst.C.E., F.R.S., was the next witness. In reply to the CHAIRMAN, he said he had been concerned in all the more important questions which had arisen in connection with water supply during the last 50 years, and had paid great attention to the reduction of the waste of water for domestic supply, having been consulted by the Liverpool Corporation as to whether or not they should adopt the waste-water meter of Mr. Deacon, their Engineer. He had also paid great attention to the supply of water from the chalk, including the question of softening it. Referring to certain calculations contained in the first part of the statement he had sent in to the Commission, he explained that they were dependent upon the correctness of his views as to the future increase of population and the reduction of the supply to 26 gallons per head per day, although he was aware that the present supply was about 31 or 32 gallons per head. In previous inquiries, all the estimates of future population which had been made had erred rather upon the side of being too small; and he put forward his figures with the utmost diffidence, knowing how signally efforts had hitherto failed in arriving at the facts. He pointed out that the New River Company had brought their supply down to 28·26 gallons, and that, between 1856 and 1866, notwithstanding the increase in population, they had actually reduced the absolute quantity of water delivered. He added that he was a Director of a small Suburban Water Company in which the total delivery was 17 gallons per diem, including that used for road watering, with a constant unrestricted supply all the day through. Taking the New River Company with their 28·26 gallons, and comparing it with the other Companies' 36·35 gallons with a mean of 30·97 gallons, he did not see why that which the New River Company did in daily practice could not be done by other Companies.

The CHAIRMAN asked witness if he thought this reduction could be realized without presupposing the granting of powers which it was improbable that Parliament would give to private companies?

Witness said he certainly thought it could, and that the regulations applicable to water-works were sufficient for the purpose. The Lambeth Company who had used the waste-water meter system in a certain portion of their area of supply, had proved that, with existing powers, they could make a reduction.

The CHAIRMAN: The population of London having, over a series of years, been accustomed to consuming large quantities of water, do you not think there would be very great difficulty in bringing the consumption down to such a point as you presuppose?

Witness took exception to the word "consuming." The population of London, he said, never "consumed," in the sense in which he used the word, such large quantities of water. They had been "provided"

for the people of London; but he did not think there would be difficulty in making them content with less. The provision was made without their knowledge; it never went into their hands, if he might use the term, in any way, and was absolutely unknown to them. This was shown by the large quantity of water which ran to waste between midnight and morning. Asked if the waste did not occur from the insufficiency of the fittings, and if there would not be difficulty in having such a continuous system of inspection as would cope with the wear and tear of the fittings, witness said he did not think so. He would maintain the constant supply, and would not restrict by one glassful the quantity of water really consumed. If a housewife wanted to use ten pails of water to scrub a floor where five would do, he would let her do it; only the water should not be allowed to go to waste. London might be looked upon as a thoroughly water-closeted town, and was not like certain of the Midland towns, where middens were still in use; and though there might be some increased demand in respect to baths, &c., the increase would be small relatively to the whole population. In his statement to the Commission, he referred to the possibility of the Lambeth Company drawing from the gravel 5,000,000 gallons of water per day. Leaving legal questions out of account, he should certainly say it could be regarded as water appropriated on its way to the Thames; and whether or not they could take that in addition to what they drew from the Thames itself was a legal question upon which he could not express any opinion. He should say the flow at Teddington Weir would be affected by such an operation; but he might be wrong in this view, as a portion of the water might go in subterranean passages, and make its escape below the weir. The ordinary assumption would be that both the quantity and the flow would be diminished. It seemed not improbable that, by the prevention of waste, at the end of 40 years the five Companies drawing from the Thames might be able to carry on their business with but trifling augmentation of the sources of supply.

Examined by Mr. MANSERGH, witness observed that, in the growing use of hot-water apparatus in small houses, there was some waste of water, but not very much; and this waste was due to the improper fixing of the apparatus.

Replying next to Sir A. GEIKIE, as to the possibility of increasing the water supply for the Metropolis from underground wells, witness expressed the opinion that it might be very largely increased without detriment to the streams on the surfaces; and he gave his reasons. He suggested taking the case of the East London Water Company, where they had in many places wells reaching the chalk by piercing an impermeable clay above. They then found water in the chalk; and that rose to a certain height when they were not pumping. This, he said, was much below the depth of the surface streams. There was, therefore, ample opportunity for the surface streams to throw down water when no pumping was going on, because the water stood at a level below them; and if pumping took place, and lowered this water by 50 feet, it did not, as it seemed to him, add to the desire, if he might use the term, of the surface streams to fall into it. On the whole, the floors of the streams were tolerably impervious, so that the water rather came from the chalk to them than from them to the chalk; and if, at a distance from where the springs came in, they lowered the water standing in the chalk below the streams, they did not thereby deprive the springs of anything. If they were to establish their wells at a point where a chalk stream came out into a spring, then he agreed that it would be different; but if they established their wells at a part where the water went into the chalk, and it had thereby to find its way through subterranean conduits, the fact of their lowering the level of the water in that part could not have any effect upon that stream.

The CHAIRMAN: You lower the level, but you are depriving the stream of it at that lower point?

Witness: What I intended to say was that, if you put your well at a place where you are dealing with chalk water, and it is near a stream, you intercept it; but if you go on to a place where the water, having come through the chalk, has found of itself its ordinary level, if you do not take it far below the stream, the fact that you lower the level cannot have any effect upon the stream.

Asked by the CHAIRMAN if he had anything further to say, witness remarked that he wished to revert to the question of waste, in order to mention what he now learned was the case—that section 17 of the Water-Works Clauses Act, 1863, provided that, if any person supplied with water wilfully and negligently suffered any apparatus or receptacle to be so out of repair or so used that the water was wasted, he was liable to a penalty of £5 for each offence.

Mr. *R. W. Peregrine Birch*, M.Inst.C.E., F.G.S., &c., was the next witness. He said he had devoted a large portion of his professional life to the consideration of hydraulic subjects, and was intimately acquainted with the Thames from Oxford to Southend. During the last twelve years, he had been professionally engaged upon several inquiries involving the question as to the circumstances under which the Water Companies take their supplies from the river. Questioned upon the statement he had sent in, he pointed out that the general effect of it was that there were no interests below Teddington which would materially suffer by a very considerable abstraction of water in addition to what was now taken. It would be perfectly easy to show that any interests that would suffer slightly could be readily compensated at a much smaller cost than would be incurred by getting the water from any other source. He was certain that 175,000,000 gallons of water per day more than was now taken could be obtained in the very worst season without hurting anybody, and without necessitating any reservoir accommodation at all.

Mr. HILL: Would there be no effect upon the river below Teddington Weir if you were to abstract all that quantity above that point?

Witness: I am not proposing to abstract quite all of it; but it would make no difference whatever to the level. There is only an inch or two of fall from one lock to the next; and it would raise the level of the lower lock to about that extent, and you would make the water in the very worst part of the reach just as good in the future as it has been in the past.

I am speaking of up to Teddington Weir. The tide goes up to there.—It would make practically no difference at all.

Do you say that is so if you abstract the whole volume of fresh water?—I have gone into that a little, and I may tell you what difference it would make. It would reduce the upland flow through Teddington Weir or through the new weir at Richmond, which will be the lowest weir in a few months. You would, at the very bottom, be reducing the level slightly. That level can be made good, perfectly well by dredging the river if necessary, as Sir John Coode recommended several years ago. Any reduction that is made in the water for the navigation below the lowest lock can be made good by a little dredging in the reaches lower down. That is one way.

Do you not think there would be a very large deposit in the reach above Teddington, if you abstracted the water from it, because you have the ebb and fresh water going down?—It is only for a very short distance.

But going on for some hours?—But it is a short distance where the stream-flow has any effect; a little way down it is lost completely. The upland water forms a small proportion of that which scours that part of the river; but without any dredging at all, that minimum flow of low water for short times can actually be made good, so that whatever value it has for scouring purposes shall be maintained and preserved to the river. That can be done in this way: The new weir at Richmond is to arrest the last half of the ebb tide; and if we could only catch the water a foot higher than we are proposing to do in very dry seasons only, for the pleasure of the people of Richmond, and discharge it, not as is now done, or proposed to be done, at the middle ebb, but at the last 4½ hours of the day, we can maintain the actual minimum flow of the river; and the scour will be the same, the depth of the river will be unaltered, and it will be in every respect precisely the same as it is now, at the 4½ hours of the worst period of the flow.

What you mean is that you would really store water to send down at that particular time?—Yes; there is nothing at all in it.

I do not know about that.—The summer flow is no good at all, under any circumstances, for scouring purposes. It is the floods and the freshets which keep the river scoured.

In concluding his evidence, witness asked permission to emphasize this—that, having said that abstraction of all the water to which he had referred would have no material effect on the lower reaches of the river, of course it would reduce the upland flow. It would decrease the dilution to which the sewage of London was subject; but if that dilution was very desirable, he wished to make it quite clear that London could obtain seven or eight times as much by taking its sewage 20 miles down the river, as by bringing an entirely fresh supply, equal to the summer flow of the Thames, from a distance of 200 miles elsewhere. Questioned as to the expense of taking the sewage lower down, he added that he should think it would be a twentieth part of what it would cost to convey clean water into London; and it would be bringing this within their own district and their own appliances, and would not be interfering with other appliances. The point he had alluded to, 20 miles below the present outfall, was the one selected by Sir Benjamin Baker and Mr. Binnie, and recommended by them.

The Commission then adjourned till the following day, when further engineering evidence was given, and continued on Friday. Reports of these proceedings will appear next week.

Electric Lighting for Accrington.—The Accrington Town Council yesterday week sanctioned a scheme for the purchase of land, and the erection, at a cost not exceeding £10,000, of an electric light station.

Stoking Machinery and the Hours of Labour at the Keighley Gas-Works.—A meeting of the men employed at the Keighley Corporation Gas-Works was held yesterday week, to discuss the difficulty which has arisen, as reported in the JOURNAL for the 27th ult. The feeling was strongly in favour of an amicable settlement of the dispute, if possible; and this, we understand, has been arrived at.

The Assessment of the Lancaster Corporation Gas and Water Works.—At the last meeting of the Lancaster Town Council, the Borough Accountant submitted the assessment upon the gas-works, showing an increase from £2692 to £4325; and it was resolved to ask Mr. Thos. Newbigging to report upon the matter. The Borough Accountant then presented the assessment on the water-works in the parish of Quernmore, which exhibited an increase from £457 to £777; and it was determined to obtain a professional opinion in regard to this also.

The Borrowing Powers of the Manchester Gas Department.—At the meeting of the Manchester City Council last Wednesday, Mr. Brooks, the Chairman of the Gas Committee, proposed a resolution to the effect that application be made to the Local Government Board for a Provisional Order to alter or amend some of the provisions of the Manchester Corporation Water-Works and Improvement Act, 1875, so as to confer upon the Corporation power to borrow, for purposes connected with the gas-works, the further principal sum of £300,000. Sir J. Harwood moved as an amendment that powers be sought to borrow £500,000. No more money would be spent; and the Local Government Board had often found fault because small sums were asked for. If his proposal were adopted, it would save the trouble and expense of making further application. Mr. Brooks accepted the suggestion; and the resolution as amended was carried.

The Quality of the Water Supply of Rotherham.—The recommendations of the Sub-Health Committee dealing with the impurities of the water supply, and suggesting certain improvements in relation thereto (as mentioned in the JOURNAL last week), were under discussion at the meeting of the Rotherham Town Council last Wednesday. The Mayor (Major Hirst), referring to the report of Dr. Thomson to the Local Government Board, said he thought it would have shown much better taste on the part of that gentleman if he had stated the steps that had been taken, and that the Corporation were about to take to improve the supply at the time of his visit. No doubt the work they had in hand would make the water purer; but it was certainly of better quality now than it had been for some years past. The adoption of the recommendations having been moved and seconded, Mr. Cox alluded to the recommendation that the Weligate spring should be disconnected from the water supply, and said, when the Engineer was before them, he told them distinctly and clearly that they could not afford to part with that source. He did not think it would be wise to pass this recommendation, and moved an amendment that the clause be struck out. This was seconded and carried; and the other proposals of the Committee were then agreed to.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Assembly of the Proprietors in this Company was held last Tuesday, at the Offices, St. Helen's Place, Bishopsgate Street—Mr. GEORGE BANBURY in the chair.

The SECRETARY (Mr. I. A. Crookenden) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the statement of accounts, which were referred to in the JOURNAL last week.

The CHAIRMAN said he regretted that, owing to the sudden indisposition of Mr. Gadesden, owing to a bronchial attack, that gentleman was unable to preside on the present occasion; and he (the speaker) had been requested to take the chair. He had had but little time for preparing any remarks; and he must therefore ask the shareholders to pardon shortcomings. He did this with all the more confidence, as what he had to say regarding the report was of a satisfactory nature. The Directors recommended a good dividend; and although there were doubtless political clouds on the horizon, their business was a sound one, and he thought he might say their prospects were fairly bright and cheering. The increase in the revenue was mainly owing to the larger rents they had received from their meter supplies. The proprietors were aware that the Company had in their district a number of trading industries; and when times were prosperous, the Company's affairs similarly flourished. The improvement in their meter-rents showed clearly that during the past year there had been a great improvement in trade throughout. The decrease in the expenses was mainly owing to their having had less to pay on account of law charges than in the corresponding period of the previous year—that was £1450, against £3800 in the previous year. These immense outlays were not of their seeking; and although, in the interests of the consumers and shareholders, they worked with the most improved and economical machinery, their terrible law charges very frequently upset their financial results. For instance, last year they had to pay nearly £5000 for appearing before the Parliamentary Committee; and this year they would have a heavy outlay in consequence of their appearance before the Royal Commission. It was true that Lord Balfour of Burleigh had ruled that Counsel were not to appear before the Commission; but scientific witnesses and experts, whose evidence was indispensable, were somewhat expensive. Then, a short time ago they had to pay £1400 merely to defend their rights and obtain protecting clauses against the Tottenham and Forest Gate Railway, which had invaded the Company's Walthamstow property, and cut through their reservoirs. Fortunately, all ended well, and they obtained the clauses they required. With respect to the progress of the works, their new engines at Lea Bridge worked far more satisfactorily and more economically than they had anticipated. They pumped 36 million gallons a day, and maintained a far better and more even pressure than their predecessors, the Cornish engines. They had to stop pumping from the Lea Bridge well for a few weeks, owing to certain necessary repairs to the pump-barrels; and since they had set to work again, they appeared to make very little impression on the large volume of water which accumulated in the well during the interval. On the occasion of a recent visit to the place, he saw a beautiful stream of more than 3½ million gallons a day being pumped directly into their mains; but although this had been going on for the last six weeks, they had made so little impression on the supply that the men were unable to resume the tunnelling work. The Walthamstow well, with only 200 yards of adits, furnished them with 2 million gallons a day; and they had no doubt that this well would exceed the quantity they now obtained from the Lea Bridge well. At Chingford, the cylinders were now down on to the chalk. They hoped in a few days to begin pumping the water out, and then excavating the chalk. They were quite certain that the water was there, because for a long time they had been pumping half a million gallons per day from a bore-hole close by. With reference to the well at Waltham, it continued to be like one of those proverbially excellent sons who have "never caused their parents one moment's uneasiness"—it had been a complete success. The triple expansion engines there worked most satisfactorily. As the proprietors were aware, there was a large surplus of water there available for future requirements. As regarded waste, they had pumped considerably less water than in the corresponding period of 1891. This satisfactory feature in their work was mainly due to the absence of those severe frosts that occurred at the commencement of last year, which caused so much worry and waste; but in addition to this they had lately strengthened their waste survey department, and, under the energetic management of Mr. Hebeler, this was beginning to give them some benefit. Notwithstanding these efforts to stop their waste, it must not be thought that they were getting at all stingy with their water, for they still supplied 36 gallons per day, as against 20 gallons in Manchester and Liverpool. He was happy to say that the analyses made by Dr. Frankland, Professor Odling, and Mr. Crookes showed that the water was well filtered, and of good quality. Attacks had been made against the purity of the London water; but these were at once refuted by the low death-rate of the Metropolis, which proved that London was the healthiest capital in the world, and far more so than Liverpool, Manchester, or Glasgow, the water supply of which was frequently lauded at the expense of that of the London Companies. The last published returns of the Registrar-General showed that the death-rate per 1000 was only 15 for Inner London and 12 for Outer London—both of which districts were supplied by the Metropolitan Water Companies. These singularly low figures disposed of any alarming rumours spread in London as to its water supply, and they should really silence the Companies' detractors. However, until the mechanicism of human nature was considerably improved, there would ever be a decided tendency on the part of buyers to depreciate the article they wished to acquire. The Company doubtless owed much of the immunity from disease and death in their district to the system of constant supply which was carried out many years ago by their late Chairman, Mr. Coope. When this system was supplied to their poorest neighbourhoods—where the fittings were bad and the consumers thoroughly careless as regards waste—it was thought that the measure was too philanthropic, too much in advance of the times, and too expensive. Certainly it was better for the consumers than the shareholders; but time had shown that, as regarded the health and comfort of their poorer customers, Mr. Coope's views were perfectly right. The proprietors were pretty well aware that nearly the whole of the Company's district was now under a constant supply. A few days ago the *Morning Post* incidentally commended the water supply and the sanitary state of their district. Speaking of the likelihood of cholera being imported simultaneously with the arrival of alien Jews, the leading article went on to say: "The experience of Hamburg would seem to show that the danger of cholera being introduced in this fashion is a real and substantial one; but, on the other hand, it must be admitted that the immigration has been going on for a long time; that the immigrants, though abominably dirty, are by no means unhealthy; that in the particular district in which they have established their chief colony in London there was not a single case of typhus fever last year; and that it is, as a rule, very fairly free from infectious disease of all kinds." Now, these Jews mostly dwelt within the limits of the Company's district; and they were so numerous that the Directors had lately had 5000 notices as to waste printed in Hebrew for distribution among them. They only hoped that the notice would answer the end for which it had been designed. As regarded the Royal Commission, the proprietors would no doubt wish him to make a few remarks. The evidence of the officials of the Companies had been recorded; and on the following day the scientific and expert witnesses would be heard on their behalf. They hoped to prove that there was a large additional supply of underground water obtainable from the chalk in the valley of the Lea and its neighbourhood available for future use. Certainly, as far as experience had been gained from their wells now in use, this contention was fully borne out. At the close of the first part of the Committee's investigations, the President said: "The Commissioners think it right to say that they have been much gratified with the readiness and willingness of the Water Companies to supply any information we have asked for, to facilitate the inquiry as far as it has gone." Although he was most unwilling to discuss any matters connected with the Royal Commission, he thought there was no harm in his saying that the evidence of Dr. Frankland, the Government Analyst, was very favourable to their system of filtration. His testimony showed that he was somewhat astonished to find that their filtration removed 98 to 99·8 per cent. of the microbe organisms, and that he failed to find any pathogenic germs in London water after passing through the filters. As regarded their establishment, he could only repeat what he said last time regarding their Engineer—that he still fully maintained his deservedly high reputation, and that their only fear was lest Mr. Bryan should overwork himself. That gentleman never spent their money on experimental schemes which had to be abandoned as expensive failures; but all his plans and improvements were so well matured that they became, on the contrary, economical successes. They also owed much to their Secretary, who continued to manage his large department with conspicuous success. Considering that the Company supplied nearly a million and a quarter consumers, many of whom were of a class not at all noted for politeness or urbanity, it seemed extraordinary that there should be so few arrears, difficulties with customers, complaints, and summonses. He could not help thinking that this satisfactory state of things was owing to the courtesy and conciliation of their superior officers having permeated the entire system; so that there was perfect freedom from anything like overbearing behaviour down to the lowest grades. He must, in conclusion, say a few words regarding a statement which lately appeared in an evening paper, to the effect that the prevalence of scarlet fever in London was due to the bad state of the water supply. He had already shown that their water had been proved by the most experienced analysts to be excellent; but it appeared, from high scientific authority, to be exceedingly doubtful whether scarlet fever was caused by water at all. Thus, a learned scientist said, during the examination of Dr. Frankland before the Royal Commission: "I have never seen it even suggested that either scarlet fever, measles, or whooping cough were communicated or communicable through water. Have you ever seen it suggested by any bacteriological authority?" To this Dr. Frankland replied: "No; I do not think any of these have even suggested it." Supposing, however, water was responsible for scarlet fever, the returns of deaths showed that the Company's supply must be of exceptional purity. Thus, in the Registrar-General's return for the last three weeks, the deaths in the East London district from scarlet fever were only 7; while in Glasgow, with 200,000 fewer inhabitants and its much vaunted Loch Katrine supply, the deaths were 24 from the same cause during a similar period. Again, in another district, supplied with the purest chalk water, but having a smaller relative population, the deaths were 13. In Liverpool, Manchester, and Leeds the deaths were also in excess, though the population was much smaller than that supplied by the East London Company. There were, therefore, no grounds for these alarming assertions. He concluded by moving the adoption of the report, and the payment of a dividend on the ordinary stock at the rate of 8 per cent. per annum, less income-tax.

Mr. H. DALTON seconded the motion.

Mr. BROWN strongly complained of the unfair way in which the London Water Companies were treated, by the dissemination of such statements as that the supply was not equal to the demand, and that the water was not pure. He thought it was well that the Companies should be looked after; but some newspapers seemed to take a pride in making the most of any little fault that might be brought against them. They also out of their own funds had to bear the attacks of the London County Council and of the City Corporation, who had no end of resources—not their own—at their backs. He had been very glad to hear that it had been impressed on all their officers not to be overbearing or off-hand with the consumers, many of whom were ready to take the least complaint before the Police Magistrates. He urged shareholders in water companies to do all they could to support their directors.

Mr. ILSLEY said he thought what the Chairman had stated was the best thing possible to remove the effects caused in people's minds by the circulation of exaggerated statements concerning the London Water Companies. He considered that, by showing civility towards their customers, they would remove the ill-will which was sometimes exhibited towards them.

The CHAIRMAN, in reply, stated that they had shown, by the analyses not only of their own Chemists, but also of the Government Analyst, that no real fault could be urged against their supply. Considering the number of people they served, and the class to which a great portion of their customers belonged, he thought it a very significant fact in the Company's favour that so few complaints were brought against them; but he had already said there was a tendency to depreciate any property that it was desired to acquire. He thought their Engineer could tell them that, before some of the water undertakings in the North were purchased by the Municipalities, they were subjected to a good deal of detraction, all of which speedily "vanished into thin air" when the concerns had been acquired.

The resolution was unanimously carried.

On the motion of Mr. ILSLEY, seconded by Mr. G. BROAD, a vote of thanks was passed to the Chairman and Directors; and a similar compliment was afterwards paid to Mr. Crookenden, Mr. Bryan, and the staff, on the proposition of Mr. BROWN.

The ENGINEER, in replying, said he could certainly endorse what the Chairman had said as regarded the transfer of the undertakings of some of the northern companies to the Municipalities. For 19 years he was Engineer to a Municipality, before he entered the service of the East London Company; and he knew that, where a local authority had been negotiating for the purchase of a water undertaking, they had generally for years before endeavoured to vilify the character of the supply.

The meeting then terminated.

THE LEICESTER CORPORATION WATER-WORKS.

Last Wednesday week, the members of the Leicester Corporation Water Committee paid their annual visit of inspection to the property under their charge; and, in connection therewith, the following particulars relating to the different reservoirs and pumping-stations have been published.

The Corporation are now constructing large reservoirs at Swithland; and, when these are completed, it is calculated that there will be sufficient storeage capacity for many years to come—the only difficulty at the present time being the precariousness of the supply of water to the reservoirs. The water-works at Thornton were commenced in 1851, and were completed in 1853. The drainage area is 2860 acres; and the area covered by water is 76 acres. The total area of land connected with the reservoir is 90 acres; and the reservoir, when full, contains 313 million gallons. The area of the filter-beds is 3587 square yards; while the surface of the water is 403 feet above sea-level. The cost of these works up to 1877, the time when the Corporation acquired them, was £108,081. The pure-water tank is 309 square yards. The water is conveyed by gravitation to the New Parks service reservoir, which is equal to holding 2 million gallons of water. The Corporation have sufficient land here to construct another service reservoir, which they intend to do, to receive the water from the new works at Swithland. The Bradgate reservoir contains a drainage area of 4400 acres; and the area covered by the water is 132 acres. The total area of land connected with the works is 170 acres; and the reservoir has a capacity of 556 million gallons. The area of the filter-beds is 7885 square yards; and the pure-water tanks, 139 square yards. These works are situated at a distance of six miles from Leicester; the water being pumped to the service reservoir at Gilrose, and from thence it proceeds by gravitation to Leicester. The Gilrose service reservoir is capable of holding 2 million gallons; and the Corporation own sufficient land here to construct another reservoir. The top of the water is 323 feet above the sea-level. There is also a pumping-station at Charnwood Street, which was established in 1887 for the purpose of pumping water from the low-level districts to the Oadby service reservoir. The engines are powerful high-pressure ones, with two cylinders, each 18 inches in length, with a 3-feet stroke, and run at a speed of 20 revolutions per minute. They pump 30,000 gallons per hour up to Oadby. The service reservoir at Oadby was constructed in 1887, and will hold a million gallons of water; and the Corporation have purchased sufficient land for the construction of three reservoirs of similar dimensions. The water is pumped from the Charnwood station to this reservoir for the better supply of the high-level districts, the inhabitants of which up to the date of the construction of this reservoir had to complain of the inadequacy of the supply. The Corporation also supply the villages of Quorn and Barrow-on-Soar with water. This they do in pursuance of an Act passed in 1890, by which they undertook to supply the two villages named, within the period of one year. The water was first turned on in May, 1891, the cost of these temporary works being about £1600. In addition, they supply the villages of Great Wigston and Kirby Muxloe. Some idea of the large demands made upon the resources of the Corporation will be formed, when it is remembered that they supply a population of 192,800 persons, and that the consumption averages about 18½ gallons per head per day.

New Water-Works for Bodmin.—The Bodmin Water Company are proposing to do away with the present system of pumping, which has been in existence for over 20 years, and to obtain a new supply from Hamatethy, in the parish of St. Breward. The water will be brought to the town by gravitation in 8-inch pipes—a distance of about eight miles. The new works are estimated to cost £8500.

Poisoned by an Escape of Gas.—On Monday last week, Mr. J. E. Bush held an inquest at Brighton touching the death of Eugene E. Hirsch, a Frenchman, 62 years of age. It appeared from the evidence that on the previous Saturday, deceased went to lodge at the house of a jeweller at 61, Ship Street; and the following morning, he was found in his room unconscious, and with the room full of gas—a burner being discovered partly turned on. Restoratives were applied; but deceased did not regain consciousness, and he died from exhaustion consequent on blood poisoning caused by the inhalation of coal gas. The jury returned a verdict in accordance with the medical evidence.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Glasgow Corporation Gas Committee have, as they did last year, gone into the market at this season for their winter supply of coal; having contracted for their summer supply in the spring. They have just completed the purchase of 120,000 tons; and have been again fortunate as regards price. A year ago, their contracts were secured at a reduction of from 1s. to 1s. 6d. per ton. The prices then agreed upon were, for cannel, from 10s. 6d. to 11s. 8d.; and for splint from 8s. 6d. to 9s. 6d. per ton. This year's contracts are, for the former, from 10s. to 11s.; and for the latter, from 7s. 3d. to 7s. 9d. per ton. There is thus a reduction this year of about 7d. per ton upon the better class of coal, and about 1s. 6d. upon the lower class. The greater quantity of the coal just purchased is of the better class—not high-class cannel, which is not required to produce 22-candle gas, but of the lower grades of cannel. The reduction will consequently not affect the working so much as if the Committee had been able to use more splint. Still, when the large quantity used is taken into account, a reduction of 7d. per ton will make a great difference at the end of the year, and should go far to counteract the fall in residuals. With the increase of 3d. per 1000 cubic feet in the price of gas which was recently imposed, and the saving upon the cost of coal, the Corporation should be able to show a good surplus when the accounts for the current year come to be presented. As compared with the prices that are paid in Edinburgh, which I gave last week, the Glasgow Corporation have greatly the advantage; but then it has to be remembered that they are contracting for coal to provide gas of 3-candle power less than in Edinburgh. Still, it remains good that they have got their better class of coal for from 10s. to 11s.; whereas in Edinburgh the lowest quality bought costs 9s. 8d. to 9s. 9d. per ton, and the better-class coal (which is only the second-class), is 18s. 4d. per ton. Personal equation must always be taken into account; and I presume the Glasgow buyers are better hands at their work than the Edinburgh ones. The average price of Edinburgh coal is 14s. 1d.; and if 10s. be taken as the average for Glasgow coal, a difference of 4s. per ton for the sake of 3 candles looks very like as if, to travesty a facetious expression, the money was not worth the candle. Everything points to the desirability of a reduction of candle power, and to the wisdom of the Glasgow Corporation in having foreseen that a low illuminating power was the correct thing. During the past year, the total quantity of coal carbonized in the works belonging to the Glasgow Corporation amounted to 458,262 tons—an increase of 38,109 tons upon the preceding year; and the average yield of gas per ton was 8981 cubic feet. Not one-twelfth part of the coal carbonized was of the first quality; and this accounts for the low yield.

The Edinburgh Town Council are in the throes of the preparation of a new Police Bill, which has for its chief object the widening of certain thoroughfares and the doing away with slum property. In connection with it, the subject of the lighting of common stairs again cropped up; and there have been conferences between Committees of the Gas Commission and the Town Council. There are over 6000 of these stair-lights; and some members of the Corporation thought it was a subject of sufficient importance to have fresh legislation upon. At a meeting of the Town Council, Mr. John Jamieson proposed that the whole cost of lighting and extinguishing the lights should be thrown upon the rates. The proposal was, however, too large an order, involving an increase of nearly 2d. to the rates; and it was not adopted. The Town Council have, in fact, resolved not to legislate upon the matter, but to rely upon their existing powers, which are quite ample for the purpose. The proceedings have accordingly resolved themselves into negotiation with the Gas Commissioners. That body was asked by the Town Council if they were prepared to reduce the charge for gas consumed on common stairs, in the event of its being arranged that the lights would be kept burning all night. This they have resolved to do. A Committee, having considered the matter, submitted to a special meeting of the Commissioners yesterday an elaborate table of charges which they were prepared to adopt, in all of which there was a considerable reduction. The principle they proceeded upon was that they would charge for the gas consumed at 3s. per 1000 cubic feet, the same as for the public lamps, which is a reduction of 10d. upon the ordinary rate. The charge for a single light, burning 1¾ cubic feet per hour, for the whole year would be 21s., instead of 27s. 6d. The Commissioners adopted the proposals of the Committee. There is, however, a condition attached—that the Town Council shall undertake full responsibility for the extinguishing of the lights, and that the lights be extinguished at the same hour as the public lamps. I am afraid these terms cannot be accepted. I have no hesitation in saying that it will be found an impossibility to get people to extinguish the lights at (say) three o'clock on a June morning. The effect will be that people will put the lights out before they retire for the night; and the Gas Committee will then be earning money for gas that will not be burned, which will lead to outcry. True, the Gas Commissioners have offered terms for half-night lighting; but my information is that the Town Council intend to require that the lighting shall be all night. It is there where the difficulty comes in; and if the Corporation see it in time, they will save themselves much trouble. A very desirable point has been gained, however it goes, in the Gas Commissioners having agreed, *ex gratiâ*, to give intimation to the Inspector of Lighting before cutting off the gas on any stair, so that the police may see to the matter, and, if there be an offender on any stair, have him prosecuted.

There is a proposal on foot at present for the amalgamation of the three Municipalities of Edinburgh, Leith, and Portobello. Mr. Mitchell Thomson, who has brought the subject forward in the Edinburgh Town Council, is generally accepted as the next Lord Provost of Edinburgh, to be elected two years hence; and as each Lord Provost likes to have his name linked with some great scheme, there are not wanting people who say that he is carving out a big thing to be carried through in his reign. In order to prevent a disclaimer by him, I may say that I do not go that length, but merely repeat what is said. Apart from motive, however, the proposal is a good one, and one which will take some time to negotiate. The strength of Mr. Mitchell Thomson's positio lies in the fact that, for the

purposes of gas supply, Edinburgh and Leith are already conjoined, and for the purposes of water supply, Portobello is conjoined with the other two; while, in the near future, it is expected that all three will also be linked together in the management of the tramways, which are likely to be taken over and worked by the Corporations. While supporting his proposal, I do not, however, homologate his view of the present arrangement. In his speech on Tuesday, in the Edinburgh Town Council, Mr. Mitchell Thomson said "it would pass the wit of man to devise a more vicious system of administering public affairs than by the creation of Trusts like the Water Trust and the Gas Commission. There was introduced into those Trusts a measure of irresponsibility among the members, which carried itself down to the officials, and was most prejudicial to the public interest." Such argument is but claptrap, and will not do his scheme any good. I feel inclined to ask him where the public interest has been prejudiced by the present arrangements, either with respect to the Gas Commission or the Water Trust. I am not so much concerned with the Commissioners or Trustees—they can protect themselves; but I want to know what official of either body has done anything to the prejudice of the public interest I know of nothing—in fact, the equipments of the Gas Commission and the Water Trust are the most complete of any of the departments managed by the Corporation. Comparisons are odious; but it is Mr. Mitchell Thomson who has instituted the comparison, and he cannot complain if I say that, in the public service of Edinburgh, if he wishes to see anything approaching prejudice to the public interest, he must look, not at the Gas Commission or the Water Trust, but to departments which have been, and are, directly managed by the Town Council. I suppose Mr. Mitchell Thomson refers to the breaking up of streets by the different bodies. That is an evil which has existed, and will exist in all time coming; and it is no worse in Edinburgh than in other towns. On that matter, too, I say the officials are not to blame, but the public. Take the case of George Street, which was paved three or four years ago, and was last year cut up by the Gas Commission in the laying of their new mains. The Gas Commission could not have foreseen three years ago the rapid extension of the city westwards and southwards, and the consequent necessity for enlarged mains.

The increase in the price of gas at Inverness, which was foreshadowed when the Corporation, in February last, gave up their wild-goose chase after electric lighting, and resolved to expend £10,000 upon the extension of the gas-works, has now been fixed at 5d. per 1000 cubic feet, raising it from 4s. 7d. to 5s. The subject was before the Gas and Water Committee last night, in a report regarding the financial position of the gas undertaking. In August, 1891, the price was advanced from 4s. 2d. to 4s. 7d. per 1000 cubic feet, the occasion then being the rise in the price of coal. It now appears that deficits have been realized in the working of the undertaking during each of the last three years. In 1889-90, the deficit amounted to £1201; in 1890-91, it was £774; and in 1891-92, it was £641. According to Mr. Thomson, the Gas Manager, this state of matters arises, not in his department, but in that of the collector. It was his opinion that the difficulty they were in would be got over if they continued the price of gas as at present; but the Committee thought otherwise, and resolved on the advance. At the same time, the Finance Committee was instructed to inquire into and report upon the whole subject of the administration of the department. The gas supplied is 25-candle power. If the Corporation would reduce that by two candles, they need have no difficulty.

About three weeks ago, a large ship, the *Auchmountain*, took fire while lying at anchor off Greenock during the night before she was to sail on her maiden voyage. Part of the cargo consisted of 42 tons of gunpowder; and about five o'clock in the morning, on the fire reaching it, there was an explosion, the sound of which was heard more than 20 miles away. The explosion was foreseen when the fire got firm hold of the vessel; and an instance of commendable forethought was last night mentioned at a Committee meeting of the Greenock Police Board. A special vote of thanks was accorded to Superintendent Taylor, of the Police Force, for his having given notice at the gas-works of the event which was about to happen, and warning the officials there of the probability of gas-lights which might be burning when it occurred being blown out. On account of the Superintendent's timely action, no accident occurred in connection with any of the lights, either public or private.

The Newport Gaslight Company, a small undertaking in Fifeshire, has closed its year satisfactorily; and has, besides paying a dividend at the usual rate of 5 per cent., reduced the price of gas from 5s. 10d. to 5s. 5d. per 1000 cubic feet.

Scotland has this week been honoured by a visit from a deputation from the Municipal Council of Faris, who have been sent to the United Kingdom to obtain information regarding water supply. They were in Glasgow on Monday, and had the arrangements for the water supply of that city explained to them by Sir James Marwick (the Town Clerk), Mr. J. M. Gale (the Water Engineer), and Mr. Robert Wilson (the Treasurer to the Water Trust). On account of the advanced season of the year at which the visit was made, it was not deemed advisable that the visitors should go to Loch Katrine to see the source of the supply; but two of their number went to Aberfoyle on Tuesday to make private inquiries. The remainder visited Edinburgh, where they were fortunate enough to see the Town Council in session. In the afternoon, they were shown the Edinburgh water-supply arrangements; and were afterwards conducted by Mr. W. Anderson, the Treasurer, and Mr. Leslie, the Engineer to the Water Trust, to Alnwickhill, where they saw the filtering-ponds, and to Torduff, where they saw the working of the reservoir system and the method of measuring. The filtering process was new to them; but the measuring at Torduff was, they said, on the same system as is carried out in connection with the water supply of Paris.

Extensions at the Rochdale Gas-Works.—Last Friday, Mr. Arnold Taylor held an inquiry, on behalf of the Local Government Board, into an application by the Rochdale Corporation to borrow, among other sums, £65,000 for the extension of the gas-works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 8.

Sulphate of Ammonia.—There is not quite so much doing, although the market keeps perfectly steady; and prices of sulphate in first hands remain unchanged. A weaker state of things is formulated by the dealers. But, on probing the position, one is at once undeceived, and it is found that not only is there very little available, but also that full prices are being realized for the few parcels on the market. Producers themselves seem to have a notion that prices will gradually harden during the second half of the month; and in this they will probably not be disappointed, unless circumstances change considerably. Buyers generally are on the *qui vive* for opportunities of cheap purchases; and this is a healthy and favourable sign. Quotations remain at £10 2s. 6d.; and the business reported below this is either fictitious, or refers to second-hand parcels pressed purposely for sale. Nitrate is steady, with a tendency towards improvement.

LONDON, *Oct.* 8.

Tar Products have exhibited but little change during the week. Benzols for prompt and forward delivery are somewhat firmer in demand, and a shade stiffer in price. The bottom seems to have been touched; and, although no great advance appears probable, a further fall is not anticipated. Anthracene has been steady at last week's prices; but the advertised offer of 1000 tons by one of the largest makers will scarcely tend to improve prices, seeing that, if advertising is now necessary, it would appear that the usual course of dealing direct with the consumers is at present unsatisfactory—no doubt owing to the decreased consumption, and the indifference of the buyers. Pitch maintains its price; and the demand is exceedingly good—facts that would indicate a probable advance before long in its value. Carbolic acid is dull; and the "boom," for the present, seems over. Prices are as follows: Tar, 9s. to 10s. Pitch, 27s. Benzol, 90's, 1s. 7½d.; 50's, 1s. 3½d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 1½d. Crude benzol naphtha, 30 per cent., 7d. Creosote, 1½d. Creosote salts, 20s. Pressed naphthalene, 40s. Carbolic acid, 60's, 1s. 3d.; 70's, 1s. 7d.; crystals, 6d. Cresol, 1s. 4d. Anthracene, 30 per cent., "A" quality, 9d.; "B" quality, 6½d.

Sulphate of Ammonia.—At the end of September, better prices were possible; but, after the turn of the month, they eased off again to about £10 to £10 1s. 3d., less 3¼ per cent. Gas liquor (10-oz.) is quoted at 6s. to 7s. per ton.

COAL TRADE REPORTS.

Lancashire Coal Trade.—The condition of the coal trade throughout this district remains without any very material change; and there is a continued absence of that activity in the demand for better qualities of round coal, which is usually looked for at this season of the year. Supplies are still in excess of requirements; and stocks continue to accumulate at many of the pits. The average quotations at the pit mouth remain at about 12s. to 12s. 6d. for best Wigan Arley; 10s. to 10s. 6d. for Pemberton four-feet and second qualities of Arley; and 8s. 6d. to 9s. for the common classes of house coal. With regard to all the lower descriptions of round coal, trade remains in a very depressed condition; and although quoted rates are nominally unchanged, there are sellers at very low figures where anything like quantities are involved—the ordinary prices averaging not more than 7s. 6d. per ton at the pit mouth. The shipping demand for steam coal continues extremely quiet; and it is exceptional where more than 8s. 6d. is being obtained for ordinary descriptions, delivered at the Garston Docks or the High Level, Liverpool. The unsettled outlook in the cotton trade is still very largely affecting the market for all descriptions of engine fuel; and although there has been some sort of understanding amongst Lancashire coal-owners that they should maintain present rates, there is a continued weakening tendency in the market, and supplies from Derbyshire and other outside districts are being pushed for sale here at very low figures. At the pit mouth, burgy is scarcely fetching more than about 6s. 3d.; best slack, 5s.; medium, 4s.; common, about 3s. 3d. to 3s. 6d. per ton.

Northern Coal Trade.—There has been a falling off in the activity in the coal trade of the North during the last few days; but it is chiefly in the demand for steam coal. Best Northumbrian steam coal may now be quoted about 10s. per ton f.o.b.; and the turns of some of the collieries are shortening, so that there is the possibility of a further fall in the price. Second-class steam coals and small steam are dull, the latter being from 3s. 6d. to 4s. 3d. per ton. Bunker coals are very quiet; the supply being large, and the price from 7s. for unscreened upwards. Gas coals are in much greater demand. There is still an abundant supply; and the price consequently does not improve. Very good Durham gas coals are obtainable at about 7s. 6d. per ton f.o.b.; and from that the price varies up to 8s. 6d. per ton. The workmen at the gas coal collieries are turning out large quantities of coal; and the shipments that are being made are very heavy, especially to the South of England. There is only a limited demand for manufacturing coals; and the tendency is towards ease in prices. For coke, the demand is large; and the price is fairly steady at 13s. 6d. per ton at the Cleveland works for best Durham blast-furnace coke; while for export, the price varies from 15s. to 16s. per ton. There are some rumours of a new railway traversing Durham, which would materially affect the coal trade of the future, if they prove to be verified.

Scotch Coal Trade.—This week has seen a little better home demand, which is attributed to the desire of many to secure stocks, in case there should be either a strike or a lock-out in the pits. Prices, however, have not been appreciably affected; and, as a matter of fact, the coalmasters in the Airdrie district have officially announced a reduction of 1s. per ton. But for foreign shipments, the trade would be in a bad way. These continue to be very large, old contracts being still in existence. Shippers are, however, looking forward with apprehension to the closing of the Baltic ports, which cannot be far off now. The failure of a Hamburg firm of coal importers, with liabilities amounting to over £20,000, a great part of which will fall upon coalmasters in the east of Scotland, has had a depressing influence on

the market. The attitude of the men is of most interest at this juncture. A big conference was held at Hamilton on Thursday, at which there was much violent protest against the reduction in wages; but all that was effected was the passing of resolutions to work only eight hours a day for five days a week, and to enforce the Mines Regulation Act with reference to unskilled labour. There was no show of resistance to the reduction. In Fifeshire the men's movement also hangs fire. The "black-list" has not yet been published, though it is reported to be ready, and to contain 9000 names. The "intimidation" policy of the past two weeks has had, it is reported, the effect of bringing men into the Union sufficient to add £600 to its funds. This is the most aggressive step which the men have taken. It may be taken for granted, from all this, that the masters have the best of the situation; and that the men are powerless to thwart them. Prices are difficult to give, as the current quotations do not represent what is being paid. The figures of last week are those which are given; but what acceptances are going are, in many cases, somewhat lower. The shipments for the past week amounted to 168,281 tons; an increase of 8508 tons upon the preceding six days, and of 25,321 tons upon the figures for the corresponding week of last year. For the year to date, the total shipments have been 5,717,249 tons—an increase over the same period of last year of no less than 690,633 tons.

Sales of Shares.—Last Tuesday, 268 new ordinary "F" shares in the *Sheffield Gas Company* were sold by auction at the following prices: 118 at £2 10s. each; 100 at £2 9s.; and 50 at £2 8s.——At the Lion Hotel, Kidderminster, last Friday, Mr. J. Nicholls sold eight £50 (10 per cent.) shares in the *Kidderminster Gas Company* for £116 each; £120 of 5 per cent. preference stock fetching £140.

Suggested Transfer of Gas-Works to the Barnoldswick Local Board.—At a meeting of the Barnoldswick Local Board last Wednesday, a letter was read from the Earby Mill Company, who are the proprietors of the gas-works at Earby, offering to sell their concern for £3750, at which price a limited company were willing to take it up. The Board were of opinion that the matter required further discussion, and no decision was come to.

Electric Lighting for Blackpool.—According to a statement made at the meeting of the Blackpool Town Council last Tuesday, the arrangements for an installation of the electric light in the town are nearly completed. A tender of £18,709 for the whole of the plant was accepted by the Council, who, it is stated, intend to use the same dynamos for running electric trams during the day and generating current at night for illumination purposes.

New Joint-Stock Companies.—The New Sulphur-Recovery Syndicate, Limited, has been formed with a capital of £10,000, in £1 shares, to acquire certain patents and inventions relating to an improved process for the recovery of sulphur, and the recovery and purification of the bye-products arising therefrom, and apparatus therefor. The Standard Sewage and Water Purification Company, Limited, with a capital of £4000, in £1 shares, is to carry on the business of chemical manufacturers and purifiers of sewage.

Electric Lighting for Middlesbrough.—At a meeting of the Middlesbrough Corporation Electric Lighting Committee last Tuesday, a report was submitted by the Sub-Committee recommending the Council to apply for a Provisional Order which would enable them to maintain their ground for two or more years, and before the expiry of that time they could proceed with an installation, or the Provisional Order could be disposed of to a private company or abandoned. Mr. Forbes having proposed the adoption of the report, Alderman Bulmer objected, and said he hoped they would let someone else try the experiment. The report gave the total cost of the light at 2·61d. per unit. But in another town, he found they had agreed to pay 6·57d. per unit, which was equivalent to 6s. per 1000 cubic feet of gas; whereas gas was supplied by the Middlesbrough Corporation at 2s. He would rather allow a private company to undertake the work, with the provision that the Corporation should have the power to take the installation over at a fixed price after the lapse of a certain number of years. Mr. Taylor thought the Corporation should take the initiative instead of leaving the matter in the hands of a private company; while Alderman Sanderson considered it was premature to entertain any idea of introducing the electric light, seeing that the Corporation were the owners of the gas-works, from which they derived a considerable revenue. On a vote being taken, the recommendation of the Sub-Committee was adopted.

The Carlisle Gas and Water Undertaking.—In a previous issue of the JOURNAL (*ante*, p. 390) we gave the results of the working of the gas and water undertakings of the Carlisle Corporation for the year ending June 30 last. The report of the Gas and Water Engineer (Mr. J. Hepworth, M. Inst.C.E.) has since reached us, and from it we extract a few additional particulars. The quantity of coal and cannel carbonized in the above-named period was 21,891 tons; as compared with 20,438 tons in 1890-91. The gas production was 220,408,000 cubic feet—an increase of 9,296,000 cubic feet on that of the preceding year; but the make per ton was 261 cubic feet less. There was an increase of 11,737,251 cubic feet in the quantity of gas accounted for; bringing down the percentage of loss from 3·17 to 1·93. These figures speak for themselves. The quantity of coke produced was 11,154 tons; of tar, 278,040 gallons; and of sulphate of ammonia, 217 tons 16 cwt. Of the first-named residual, 3101 tons 12 cwt. were used in manufacture. The extent to which gas is employed for other than lighting purposes is shown by the following figures, giving the number of heating and trade appliances in use at the close of the past financial year: Cooking-stoves, 599; gas-fires and heating-stoves, 1033; boiling-stoves, 322; and gas-engines, 35. With regard to the water undertaking, there was an increase of 11,896,529 gallons of water pumped—viz., 368,432,147 gallons in 1890-91, and 380,328,676 gallons in 1891-2. The water supplied for domestic purposes amounted to 266,137,147 gallons in the former, and to 280,977,676 gallons in the latter year—an increase of 14,840,529 gallons; that employed in trade being less by 2,944,000 gallons. The average daily supply for all purposes was 24·74 gallons per head of the population, as compared with 24·03 gallons in 1890-91.

Bombay Gas Company.—The Directors of this Company announce an interim dividend at the rate of 7 per cent. per annum for the half year ending June 30 last.

Electric Lighting in South Africa.—According to a statement which lately appeared in the *Press* of Pretoria, large electric light works constructed by Messrs. Crompton and Co., Limited, have been opened for the supply of the town. The lighting of the streets is effected by means of 102 lamps erected at the intersections of the streets; 77 of these are Crompton arc lamps of 500-candle power, and the remainder are incandescent lamps of 32-candle power, placed in the less-frequented thoroughfares.

New Gas-Works for Stockton.—The Stockton Corporation have decided to promote a Bill in Parliament empowering them to borrow additional capital in connection with the gas undertaking. They have just completed a large new gasholder, which it is intended to utilize for reserve purposes. The demands of the town for gas, however, have so rapidly increased, not only for lighting purposes, but also for cooking and heating, that the capital is now exhausted; and applications having been repeatedly made to the Corporation to light a number of the villages within a radius of five miles of Stockton, they have resolved to seek Parliamentary powers to enable them to build new works. The present works are situated in the north-west part of Stockton; and the new ones it is suggested should be erected at Thornaby-on-Tees (formerly South Stockton), which town obtains its supply of gas from Stockton. The Corporation purchased the gas-works in 1857; and their last Act was obtained in 1872.

The Ilkley Local Board and the Gas-Works.—It appears that a small minority of recently-elected members of the Ilkley Local Board deprecate the action so far taken by that body in prosecuting a Bill in Parliament for the compulsory acquisition of the Ilkley Gas-Works; the reason assigned for the attitude assumed being a conviction that gas will inevitably be superseded by electricity, as a lighting agent, and in addition, it is said that Ilkley is exceptionally situated in reference to utilizing water as an economical motive power for generating the electric current. As the outcome of these opinions, a notice of resolution was given by Mr. Illingworth at the previous monthly Board meeting, and moved last Wednesday, to the effect that "no further action should be taken in reference to acquiring the Ilkley Gas-Works without first consulting the ratepayers by again calling a public meeting in reference to the question." As, however, the ratepayers have already been twice consulted in the matter, and every opportunity given for objection to be raised, the majority of the Board appeared to think that any further public consideration of the question in the position at present occupied by the Board was unwise and unnecessary, and it was resolved that the further consideration of the question, as embodied in Mr. Illingworth's resolution, should be disposed of in Committee.

Failure of the Electric Light in Dublin.—Owing, it is stated, to the falling off of steam pressure at the Dublin central electric light station last Tuesday night, the principal thoroughfares of the city were thrown into temporary darkness by the partial failure of the electric light. The lamps suddenly became dull, and many of them were extinguished altogether. Under the heading of "Dublin by Moonlight Alone," a correspondent of the *Evening Telegraph* the next day referred to the occurrence in the following terms: "Last night the pedestrians of Grafton Street, College Green, Dame Street, and O'Connell Street were treated to a promenade by moonlight alone; the electric light getting dimmer and dimmer, until at length it went completely out. A lamp here and there tried to regain its brilliancy, but only for a moment; for, seeing that it was almost deserted, it would lose heart and go out also. No gas-lamps were lighted in the above-named streets; only those belonging to the public buildings. Now, I ask what accidents might not have occurred in the streets had it not been that the moon happened to shed her bright light over those darkened thoroughfares. Surely the gas-lamps can be kept lighted until the Corporation are in a position to guarantee effectual lighting by the electric light. If I mistake not, the citizens were fed up with the idea that, even if anything did happen to the machinery, at any rate one side of the street would be illuminated. However, there is an old saying: 'You pay your money and you take your choice.' In this case you pay your taxes and you take your choice—either electric light, moonlight, or none at all."

The Public Lighting of Honiton.—It appears that for some time past the public lighting of Honiton has been the subject of considerable dispute between the parties concerned therewith. The gas-works, although the property of the Honiton Gas Company, are in the hands of a lessee, who lights the streets under a yearly contract—providing the lamps, supplying the gas, and doing the lighting, extinguishing, and repairs. Finding the amount paid per lamp per night—viz., just over 2d. (2½d., to be strictly accurate)—insufficient, as the lamps are kept alight all night, moon or no moon, he intimated to the Corporation that they must either reduce the hours of lighting or pay an increased price; but to neither of these propositions would they consent. He then offered to light by meter at the same rate as that charged to private consumers, if the Corporation kept to the same hours of lighting as previously specified, and pay for the meters. To this they agreed. Then the Town Clerk submitted a draft agreement, in which it was stipulated that the lessee should find all lamps, mains, and services, and light, extinguish, and repair, as well as be responsible for any accident occurring to anybody or anything, without further remuneration; also that the Council should have the power to regulate the lighting every month, without the lessee's sanction. To this, as a matter of course, he would not consent. Now the Town Clerk and the lessee's Solicitor are fighting the matter out; and, in the meantime, the lessee is lighting the lamps without prejudice. We understand that he has offered to submit the whole question to arbitration; but to this the Council will not agree. This is a very unpleasant state of things, which ought to be put an end to as soon as possible. If the Corporation are dissatisfied with the way in which the public lighting is now done, why do they not take it entirely into their own hands? Surely they would be able to do it properly; and, seeing the trouble the lessee is put to over the matter, he would probably be glad to be relieved of it.

The Leeds Corporation Gas Coal Contracts.—Contracts for coal have just been completed by the Leeds Corporation Gas Committee at an average of 11s. 1d., or a saving of 1s. 3d. per ton, as compared with the previous contracts. The coal is of a somewhat inferior character; but the Gas Committee believe that gas of equal quality will be obtained from it.

The Water Question at Gloucester.—Another proposal was made at the last meeting of the Gloucester City Council, with the view of overcoming the difficulties which appear to meet the Water Committee in whichever direction they turn for an additional source of water supply. The present plan emanated from Mr. Sydney Turner, who suggested a duplicate system of water mains and services—one set for supplying drinking water from Witcomb, and the other for a supply from the Severn, to be used for flushing purposes. Such a scheme, he thought, would be an ideal sanitary arrangement; and he moved a resolution asking the Water Committee to report upon it. This was adopted with only one dissentient.

Dorking Gas Company.—At the half-yearly meeting of this Company a few days ago, the report which was submitted by the Directors, and adopted, stated that there had been an increase of rather more than 7 per cent. in the sale of gas as compared with the corresponding period of 1891; but, in common with other gas undertakings, the receipts for the residual products had very much fallen off, and the prices had still a downward tendency. From the profit made during the half year, *plus* £480 brought forward, the Directors recommended the payment of dividends at the rate of 8 per cent. on the "A" and "B" shares, and at the rate of 7 per cent. on the "C" shares; leaving a balance of £500 to be carried to the next account.

The Water Question at Chester.—The General Purposes Committee of the Chester Town Council had under consideration last Wednesday the action they should take regarding the present agitation for an inquiry as to the purity or otherwise of the Chester water supply. The Council, while not admitting that there was any necessity for an inquiry, were agreeable to a suggestion made by the Duke of Westminster that a Committee of citizens and representatives of the Public Health Committee of the Council and the Water Company should confer together and take such steps as will reassure the citizens in the matter. It was resolved that the Council be represented by Dr. Roberts, Chairman of the Public Health Committee.——The Duke of Westminster last Friday presided over a largely attended meeting of ratepayers to consider the question. In opening the proceedings, the Duke read a letter from the Water Company stating that they would be glad to afford any information and assistance to any Committee which might be appointed in case an inquiry should be instituted on the subject. Having referred to the importance of the question, his Grace claimed that those who were bringing the matter forward were actuated by the purest motives, and the subject was one which affected all classes. He then referred to the amount of sewage which found its way into the river, and pointed out that the Company had an admirable system of filtration; and they gave as good a supply of water as they could, taking it from a tainted and impure source. The *crux* of the matter was whether they could convert a supply of impure water by any means into one which should be innocuous to the community. The Bishop of Chester moved—"That, in the opinion of this meeting, the Chester water supply is open to such grave suspicion, that steps should at once be taken either to remove that suspicion, or if, on further investigation, it should be established, to seek a new and purer source of supply." His Lordship spoke of the more than suspicious character of the water; and described the Dee, from a sanitary point of view, as a main sewer. The resolution was carried unanimously. An influential Committee, with the Duke of Westminster as Chairman, was appointed to confer with the Health Committee and the Water Company, and report to an adjourned meeting.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 632.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apr.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	"	7½	Do. 7 p. c.	10	11—12	..	6 5 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	27 May	8	Bahia, Limited	20	10—12	..	13 6 8
200,000	5	12 May	7½	Bombay, Limited	5	6—6⅜	..	5 15 9
40,000	5	"	7½	Do. New	4	4—4⅜	..	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	212—217	..	5 10 7
150,000	"	"	9½	Do. New	100	163—168	..	5 10 1
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	95—100	..	5 0 0
320,000	20	29 Sept	11½	British	20	41—43*	..	5 4 8
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	"	8½	Do. 7 p. c.	10	14½—15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	6—7	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	92—95	..	6 6 4
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	13 Apr.	13	Commercial, Old Stock	100	237—242	+2	5 7 6
165,000	"	"	10	Do. New do.	100	183—188	..	5 6 4
160,762	"	15 June	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 4
800,000	Stck.	15 June	10	Continental Union, Limited	100	225—230	+1	4 6 11
200,000	"	"	7	Do. 7 p. c. Pref	100	190—195	..	5 2 7
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	+5	5 5 3
486,090	10	28 July	10	European, Limited	10	19½—20½	..	4 17 7
354,060	10	"	10	Do. Partly paid	7½	14—15	..	5 0 0
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	215—220	..	5 9 1
100,000	"	"	4	Do. B, 4 p. c. max.	100	95—98	..	4 1 7
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	257—262	..	3 16 3
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 7
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	166—171	..	4 7 8
1,300,000	"	"	7	Do. H, 7 p. c. max	100	162—167	..	4 3 10
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	255—260	..	3 16 11
476,000	"	"	6	Do. K, 6 p. c. Prf.	100	150—154	..	3 17 11
1,061,150	"	15 June	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
294,850	"	"	4½	Do. 4½ p. c. do.	100	123—127	..	3 10 10
908,000	"	"	6	Do. 6 p. c. do	100	164—169	..	3 11 0
3,800,000	Stck.	12 May	12	Imperial Continental	100	228—230	+2	5 4 4
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	4—4⅜	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	106—108*	..	4 12 7
541,920	20	15 June	5	Monte Video, Limited	20	12¾—13¼	..	7 8 2
150,000	5	27 May	10	Oriental, Limited	5	8⅛—8⅜	..	5 14 3
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—5*	..	7 0 0
166,870	10	—	2	Pará Limited	10	1½—2½	..	—
420,000	100	3 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	106—110	..	5 9 1
500,000	100	1 June	6	and Do.	100	100—104	..	5 16 7
150,000	10	—	10	San Paulo, Limited	10	7⅞—8⅜	+1	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	275—285	+2½	5 8 9
1,350,000	"	"	12	Do. B do.	100	229—234	+2	5 2 6
230,000	"	"	13	Do. C do.	100	240—245	..	5 6 1
725,000	"	14 July	5	Do. 5 p. c. Deb. Stk.	100	140—114	..	3 9 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
743,952	Stck.	1 July	10	Chelsea, Ordinary	100	245—250	..	4 0 0
1,720,252	Stck.	13 Apr.	8	East London, Ordinary	100	197—202	..	3 19 2
544,440	"	1 July	4½	Do. 4½ p. c. Deb. Stk.	100	140—144	..	3 2 6
700,000	50	1 July	8½	Grand Junction	50	99—103	..	3 17 8
708,000	Stck.	12 Aug.	11	Kent	100	262—267	+2	4 2 5
1,043,800	100	1 July	9½	Lambeth, 10 p. c. max.	100	215—220	..	4 6 4
406,200	100	"	7½	Do. 7½ p. c. max.	100	190—194	..	3 17 3
279,700	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	122-125*	..	3 4 0
500,000	100	12 Aug.	12½	New River, New Shares	100	320—330	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	128—132	..	3 0 7
902,300	Stck.	15 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	147—150	+2	4 6 8
126,500	100	"	6½	Do. D 7½ p. c. do.	100	134—138	..	4 14 3
1,155,066	Stck.	15 June	10	West Middlesex	100	240—245	..	4 1 7

*Ex div

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." **GWYNNE & CO.,** TELEPHONE No. 2698.

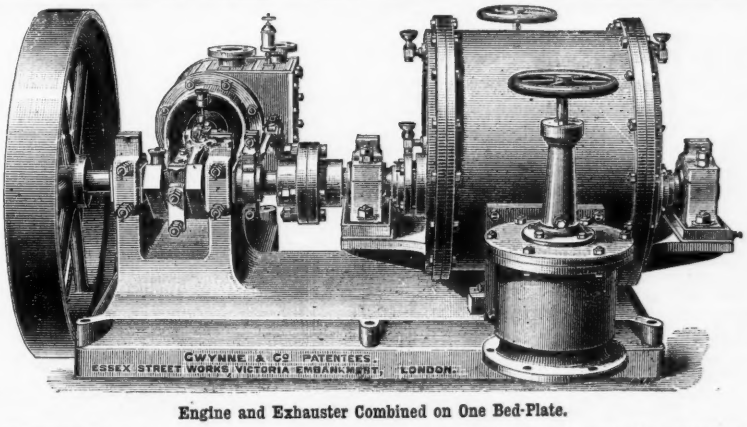
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HUTCHINSON BROTHERS, Barnsley,
Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

TUBES AND FITTINGS

FOR Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

TO GAS ENGINEERS AND MANAGERS.

R. ANDREWS, Retort Setter. Thirty years' practical experience. Retorts set on the Regenerative Principle or Ordinary Settings; Benches built; Repairs, &c.
Address 67, Sugden Road, Lavender Hill, LONDON, S.W.

WANTED, a Situation as Working MANAGER of Small, or FOREMAN, of larger Works. Have held both positions. Practical Mechanic, used to Gas-Works Machinery, Mains, Services, Meters, &c., with knowledge of Sulphate Manufacture. Testimonials and References.
Address No. 2146, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young married Man (abstainer), a SITUATION as WORKING MANAGER of Gas-Works, making about 10 millions. Has held present Colonial Management over three years, in which he has Engine, Exhauster, &c., under his charge. Could be disengaged in about Three Months.
Address No. 2141, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR-WORKS.

WANTED, immediately, a Still hand.
State experience, salary required, and any other particulars.
Sealed applications to be made to No. 2148, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.

WANTED, a first-rate Draughtsman accustomed to Gas-Works Plant. Salary, £2 2s. per week. State age, experience, and enclose three recent testimonials.
Apply, by letter, to No. 2149, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING GAS FOREMAN.

WANTED, an active and intelligent Young Man, as WORKING FOREMAN, to do the Stoking and to take the management of small Country Works. House, Gas, and Coals found.
Apply, stating age, references, and wages required, to Messrs. MOSSOP and MOSSOP, Solicitors, Long Sutton, LINCS.

WANTED, a Working Manager for Smal Works. Make about 6 millions. Must be a good Carbonizer, able to lay Mains and Services, fix Meters, and collect Accounts. He will have sole charge; only one Master—the Lessee. House on the Works free. A good man used to a country life may do well.
State (by letter) salary required, experience, age, and references, to No. 2150, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. IV., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

MESSRS. DEBENHAM, TEWSON FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

WANTED, a second-hand Scrubber, to pass 5000 feet per hour.
Address the YEADON GAS-RETORT SYNDICATE, Ltd., Albion Place, LEEDS.

WANTED, two second-hand Purifiers, 8 feet square by 4 or 5 feet deep, with or without Valves and Connections. Must be good to refix.
Price, &c., to the GAS COMPANY, Elsecar, near Barnsley, YORKS.

FOR SALE—A perfectly new 20,000 cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. MARSH, 41, Corporation Street, MANCHESTER.

FOR SALE, Suitable for Small Works or Testing Works—Two CAST-IRON ⊓ RETORTS 6 feet long, with Ascension, Bridge, and Dip Pipes, Wrought-Iron HYDRAULIC MAIN for two Retorts, CONDENSER PIPES and BOX, PURIFIER, 4 ft. by 2 ft. 5 in., three GASHOLDER COLUMNS, 11 ft. long, 6 in. diameter at base, 4 in. at top.
Apply to the MANAGER, Gas-Works, LLANTRISANT.

SELF-SEALING MOUTHPIECES.

THE Carlisle Gas Committee have for SALE 50 TANGYES' (Morton's Patent) SELF-SEALING OVAL MOUTHPIECES and LIDS, 21 in. by 15 in. The Mouthpieces are in good condition, having been in use for a short time only.
For further particulars, apply to J. HEPWORTH, Gas-Works, CARLISLE.

FOR SALE—Second-Hand Gas Plant:
Two Wrought-Iron CHIMNEYS, 42 ft. long, tapering from 4 ft. to 3 ft. 6 in. by $\frac{5}{16}$ in. Plates.
22 Wrought-Iron HYDRAULIC MAINS, 16 ft. by 19 ft. by 9 ft. long, with Cast-Iron Covers, having Seven holes for Dip-Pipes.
154 ⊓ MOUTHPIECES, Tangye's patent Lids, 20 in. by 16 in.
18 6 in. GAS-VALVES.
One Horizontal Tangyes' ENGINE, with EXHAUSTER combined, to pass 20,000 cubic feet per hour.
Also a lot of H-PIPES and ASCENSION and DIP PIPES.
For further particulars, apply either by letter, or personally, to Mr. B. W. SMITH, Engineer, Gas-Works, SMETHWICK.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application, OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, Cathedral Chambers, Half Street, MANCHESTER.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, 68, Bath Street, GLASGOW. Telegraphic Address: "Gas, Glasgow." Depôts throughout England and Scotland.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps and other Apparatus for Gas Lighting, &c.

BOROUGH OF DARLINGTON.

THE Gas-Works Committee invite Offers for the purchase of about 130 tons of SPENT OXIDE (Bog Ore), guaranteed to contain not less than 50 per cent. of Sulphur.
Tenders, endorsed "Tender for Spent Oxide," to be sent to me not later than the 20th inst.
No pledge is given that the highest or any offer will be accepted.

By order,
F. T. STEAVENSON,
Town Clerk.

Darlington, Oct. 3, 1892.

THE GASLIGHT AND COKE COMPANY.

SALE OF ANTHRACENE.

THE Directors of The Gaslight and Coke Company are prepared to receive TENDERS for the purchase of 1000 tons of 32 per cent. ANTHRACENE, delivery of which is to be taken between the 15th of October, 1892, and the 30th of June, 1893.
Tenders to be sent in, not later than Noon on Thursday, the 13th of October inst., addressed to Mr. W. G. Blagden, the Company's Agent, at his Office, No. 4, Fenchurch Avenue, Lime Street, London, E.C., where also Forms of Specification and Tender can be obtained upon application.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road, Westminster, S.W., Oct. 7, 1892.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Isle of Thanet Gas Company are prepared to receive TENDERS for 100,000 gallons of TAR, or less quantity, at their Works at Margate.
The said Tar will be pumped into Tanks or Barrels on the Company's Premises; but all other costs and charges to be paid by the Contractor.
The Directors do not bind themselves to accept the highest or any tender.
Tenders to be sent in on or before Tuesday, Oct. 18, addressed to the Chairman of the Company.
Further information can be had on application to the Manager.

By order,
THOS. C. FULLER,
Secretary.

Gas Offices: The Dane, Margate, Oct. 7, 1892.

BOROUGH OF NELSON.

(GAS DEPARTMENT.)

THE Gas Committee of the above Cor- poration invite TENDERS for the construction and erection of a FOUR-LIFT GASHOLDER, 150 feet diameter, at their Brierfield Works.
Plans and Specifications can be seen at the Office of the Engineer, Mr. W. Foster, Gas-Works, Nelson.
Form of Tender may be obtained from the Engineer on deposit of Three Guineas, which will be returned on receipt of a *bonâ fide* tender.
Sealed tenders, endorsed "Gasholder," and addressed to Mr. R. M. Prescott, Town Hall, Nelson, to be sent in on or before Saturday, the 22nd day of October, 1892.
The Committee do not bind themselves to accept the lowest or any tender.

By order
R. M. PRESCOTT
Town Clerk.

Town Hall, Nelson, Sept. 30, 1892.

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

ROCHESTER, CHATHAM, AND STROOD GAS-LIGHT COMPANY.

SUPPLY OF COALS.

THE Directors of the above Company invite TENDERS for the supply of 30,100 tons of GAS COALS, to be delivered between the 1st of November next and the 31st of July, 1893.

Particulars and copy of Form of Tender and Contract may be had on application to

WILLIAM SYMS,
Secretary and Manager.

Gas Office: 58, High Street, Rochester,
Sept. 22, 1892.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 1st day of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 30th of June last, and the usual Ordinary Business of such Meeting transacted.

Notice is hereby also given, that the Transfer Books will be closed from the 18th inst. to the 1st of November, both days inclusive.

By order of the Board,
R. S. GARDINER,
Secretary.

No. 21, Austin Friars, London, E.C.,
Oct. 10, 1892.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE BY TENDER OF 500 ORDINARY £10 SHARES,

Being a portion of Additional Capital authorized to be raised under the powers of the Croydon Gas Act, 1877.

MINIMUM PRICE, £22 PER SHARE.

THE Directors give notice that they will be prepared to receive—not later than Eleven o'clock on the Morning of Wednesday, the 12th of October, 1892—sealed TENDERS for 500 ORDINARY £10 SHARES, to be paid up in full on or before the 31st of October, 1892, from which date Dividend will commence to accrue.

The last Dividend paid upon this class of Shares was at the rate of 11 per Cent. per Annum.

One Share, or any number of the 500 £10 Shares, may be tendered for, and the respective Share or Shares will be registered in the names of the purchasers, or their nominees, free of expense.

Printed Particulars and Conditions of Sale, and Form of Tender, can be obtained at the Offices of the Company, Katharine Street, Croydon.

WILLIAM J. RUSSELL,
Secretary.

Sept. 7, 1892.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing BY AUCTION of GAS and WATER SHARES under Parliamentary powers.

He also holds MONTHLY SALES of GAS and WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

The next Sale will take place at the Mart, on Monday, Oct. 17, at Two o'clock precisely, and will consist of Shares in the following Companies (part of the Estates of Matthew Revill, Esq., deceased, and Dr. May, deceased):—

Mitcham and Wimbledon Gas Company.
Hornsey Gas Company.
Tottenham and Edmonton Gas Company.
Harrow District Gas Company.
South-West Suburban Water Company.
London and County Land and Building Company, Limited.

Terms for including Shares in these Sales, and all particulars relating thereto, may be had of Mr. ALFRED RICHARDS.

Offices: 18, FINSBURY CIRCUS, E.C.

Now Ready, Price 6s., Cloth Bound.

THE CHEMISTRY OF ILLUMINATING GAS,

By

NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

For **FIRE-BRICKS**, the most durable for **GAS-FURNACES**,

ADDRESS

JAMES WHITE & Co., Limited,
ALBERT WORKS, WIDNES.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION
T. B. KITTEL, SHEFFIELD.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

THOMAS TURTON AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

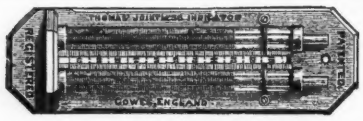
Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE.
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.



THOMAS'S JOINTLESS GAS GAUGES.
COWES, I.W.
American Patent for Sale.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)
PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over
400,000 Tons per Annum.
Full particulars on application to
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.
Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from
C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

COKE BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
For Exhauster Advertisement, see last week.
GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.

THE SILICA FIRE-BRICK
COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS,
BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

GASHOLDERS
C. & W. WALKER
Are now erecting a four-lift Holder of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.
PURIFIERS;
PURIFYING MACHINES;
CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
SULPHATE & SULPHUR PLANT;
PATENT SELF-SEALING RETORT MOUTHPIECES;
LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;
SOLE MANUFACTURERS OF WECK'S PATENT CENTRE-VALVE;
PATENT TAR PLANT; CONDENSERS;
SLIDE VALVES; TAR BURNERS; &C., &C.
WOOD SIEVES.

ADDRESSES:
MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;
10, Finsbury Square, London.
"FORTRESS DONNINGTON." "FORTRESS LONDON."—Telegraphic.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

AUG. KLÖNNE,
DORTMUND (GERMANY).

REGENERATIVE FURNACES.

Unsurpassed in
Efficiency, Economy, Durability, and Easy Working.

ALEXANDER RUSSELL & CO.,
Cannel and Gas Coal Merchants,
53, WATERLOO STREET,
GLASGOW.

OXIDE OF IRON.

TO GAS MANAGERS, DEALERS, OR AGENTS.

We have for sale **Pure Oxide of Iron,** containing 77 per cent. Oxide of Iron and 17 per cent. Water. Different qualities can be supplied according to requirements.

PRICES LOW.

Apply to—

READ HOLLIDAY & SONS, Limited, HUDDERSFIELD.

THE "METEOR" HIGH-POWER GAS-LAMP.

CLASS B.

The Electric Light's greatest Rival. Has been awarded 8 Gold and Silver Medals.

For inside, and outdoor Lighting.

THE "METEOR" LAMP IS

The cheapest
The simplest
The most economic
The most durable
The most brilliant
The best ventilating
The most easily cleaned

Lamp in Existence.

The best and most suitable Lamp for hiring and hire-purchase. Being made entirely of fine Cast-Iron, the "Meteor" is practically indestructible. Greatly reduced prices. Liberal terms. Write for new descriptive reduced price list.

N.B.—Accessories are now offered at greatly reduced prices.

W. J. MOORE,
Sole Manufacturer's Representative,
83, UPPER THAMES STREET, LONDON, E.C.

Telegrams { "Gastoves Warrington." / "Gasapparatus, London."

E. W. T. RICHMOND, Managing Director.

GAS-FIRE SEASON, 1892-3.

NEW PATTERNS.

ROUND AND SQUARE PROJECTING FIRES.

NEW FUEL.

CYLINDRICAL APPEARANCE, SIMILAR TO LOG FIRE.

NEW BURNERS.

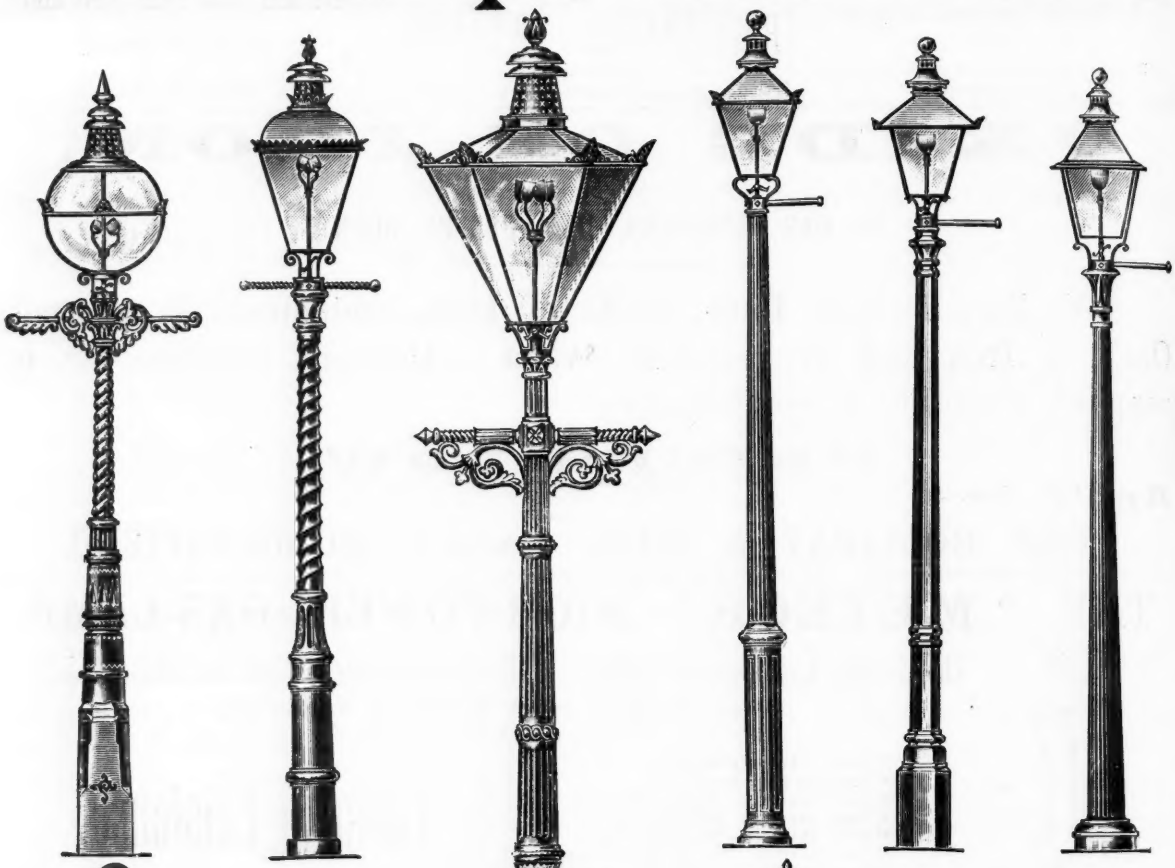
EXTRA MIXING-CHAMBER. SILENT. BURNS EVENLY. WILL NOT LIGHT BACK.

All fitted with Nickle PlatedTrivets free.

LONDON SHOW-ROOMS:

93, CHEAPSIDE (Corner of King Street), **E.C.**

Gas Lamps and Posts.



Patent Street Lamps.

NO PUTTY.

Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

Lamplighters' Torches.

Lever Taps.

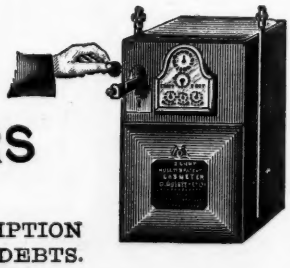
Lamp Governors.

PRICE LIST ON APPLICATION.

SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

GAS-METERS.



PREPAYMENT METERS

(PRICE'S PATENT)

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

D. HULETT & Co., Ltd.,

55 & 56, HIGH HOLBORN, LONDON.

Price: Morocco, Gilt, 18s.; Cloth, 15s.; Delivered Free.

THE FIFTH EDITION OF THE

HANDBOOK

FOR

Gas Engineers and Managers,

By THOMAS NEWBIGGING, M.Inst.C.E.

LONDON:

WALTER KING, 11, Bolt Court, Fleet Street, E.C.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

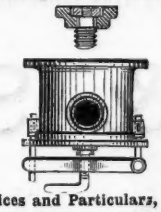
RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

BOX'S NEW PATENT RETORT-LID FASTENER.

For Illustrated Description, see JOURNAL, Aug. 23, p. 346.

CANNOT GET OUT OF ORDER.



DOES NOT DAMAGE LIDS.

SIMPLE AND EFFECTIVE.

CHEAP AND DURABLE.

For Prices and Particulars, apply to

W. W. BOX,

Gas-Works, CRAYFORD, Kent.

TELEGRAPHIC ADDRESS: "GAS LIDS."

60, QUEEN VICTORIA STREET, E.C. LONDON OFFICE.

CLAYTON, SON, & Co.

LIMITED,

LEEDS,

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

STEEL SCOOPS

FOR

RETORT CHARGING.

Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,

66, BANKSIDE, LONDON, S.E.

WILSON CARTER & PEARSON,

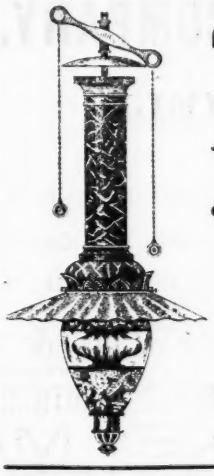
GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

The Climax of Regenerative Gas Lighting!!



THE

"VERTMARCHE"

Cheapest and most durable Gas-Lamp.

A 280-CANDLE POWER PLAIN IRON LAMP,

CLASS A—

55/-

Manufactured in England by

HENRY GREENE & SONS,

153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

J. & W. HORTON

ETNA WORKS,

SMETHWICK,

NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES AND MANUFACTURERS OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

Note Change of London Address:

HENRY PUPLETT,

47, VICTORIA STREET, S.W.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, ST. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (FOUR APPARATUS).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations–

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

Telegrams: "ATLAS SHEFFIELD."

JONAS DRAKE & SON,

TELEGRAPHIC ADDRESS:
"DRAKESON, HALIFAX."

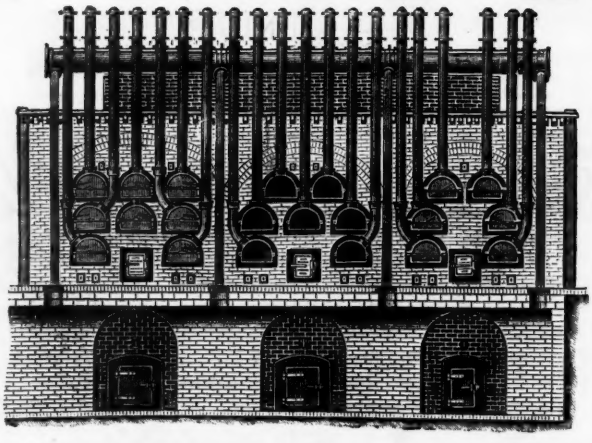
TELEPHONE No. 43.
HALIFAX EXCHANGE.

GAS ENGINEERS,

CONTRACTORS,

IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS,

FURNACE BUILDERS

ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

INCLINED RETORTS

GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.

OVENDEN, HALIFAX.

DRAWINGS SPECIFICATIONS, AND ALL OTHER PARTICULARS ON APPLICATION.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET.
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY OF

GASHOLDERS

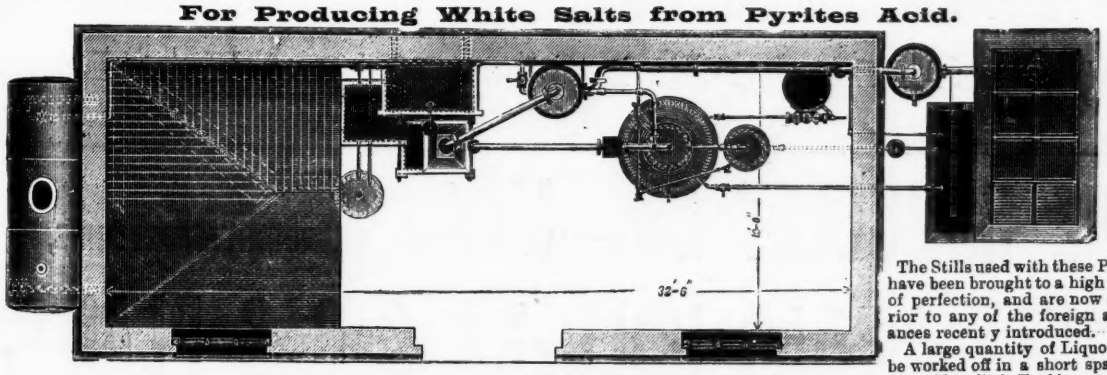
AND MAKERS OF

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

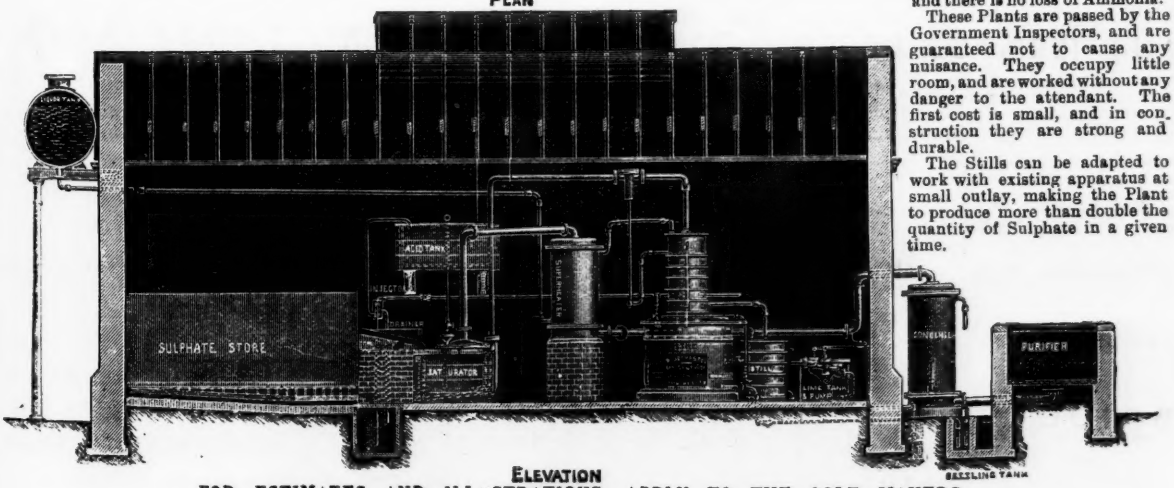
GAS PLANT OF EVERY DESCRIPTION.

SULPHATE OF AMMONIA PLANTS

For Producing White Salts from Pyrites Acid.



PLAN



ELEVATION

The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recent y introduced.

A large quantity of Liquor can be worked off in a short space of time. Very little Fuel is required; and there is no loss of Ammonia.

These Plants are passed by the Government Inspectors, and are guaranteed not to cause any nuisance. They occupy little room, and are worked without any danger to the attendant. The first cost is small, and in construction they are strong and durable.

The Stills can be adapted to work with existing apparatus at small outlay, making the Plant to produce more than double the quantity of Sulphate in a given time.

FOR ESTIMATES AND ILLUSTRATIONS, APPLY TO THE SOLE MAKERS,

R. & J. DEMPSTER,

ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

LONDON OFFICES: 181, GRESHAM HOUSE, OLD BROAD STREET, E.C.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

FOR RETORT-SETTINGS & FURNACE WORK

OF EVERY DESCRIPTION,

Messrs. J. & H. ROBUS,

20, BUCKLERSBURY, LONDON, E.C.,

ARE PREPARED TO SUBMIT PLANS, SPECIFICATIONS, AND ESTIMATES.

Contractors for the complete Erection of Gas and Water Works, including Main Laying.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF

GAS HOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES

PIPES, LAMP PILLARS. RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

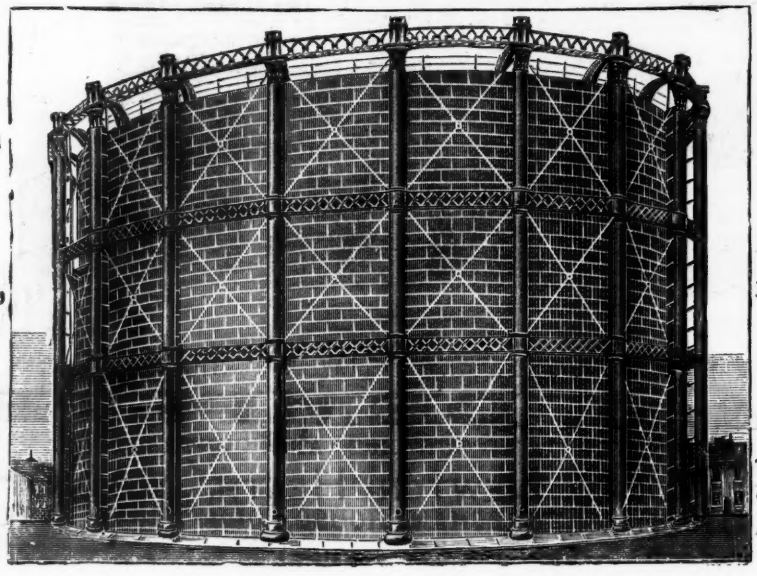
STRUCTURAL IRON

AND STEEL WORK,

BRIDGES,

ROOFS,

PIERS, ETC.



WORKS & HEAD OFFICE:
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable; while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

IMPERIAL TUBE WORKS
WOLVERHAMPTON.

WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy of Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

The Carburettors have been doing practical work for the past two years; in many cases doing all the enrichment without the use of Cannel or other rich Coals. The South Metropolitan Gas Company have these Enrichers at all their Stations. The Gaslight and Coke Company have had them in use at some of their principal Works for two years past; and several more are now being fixed at their other Stations. The Carburettors are also in use at several Suburban and Provincial Gas Companies' Works.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

(FRANK W. CLARK, Engineer and Manager)

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON.

Crosbie's Manufactures have been supplied to the following Local Authorities and Gas-Works:—

ABERDOVEY.
ALDRIDGE.
ANTRIM.
ARMAGH.
ASCOT.
BALLYMENA.
BENTHAM.
BIRMINGHAM.
BOGNOR.
BRAMHAM.
BRANDON.
BROADSTAIRS.
BROMSGROVE.
BURTON.
CARLOW.
CHESTERTON.
COBHAM.
CRANBROOK.
CULLEN.
DEWSBURY.
DOWNPATRICK.
ELLAND.
ELLESMERE.
GARSTON.
GILLINGHAM.
GOREY.
HANLEY.
HENDON.
HINCKLEY.
HONITON.
HUNTINGDON.
ILKESTON.
IRTHLINGBORO'
KEGWORTH.

Contractor to Her Majesty's Government and the Indian Government.

Contractor to the Turkish Government and many Local Authorities.

Crosbie's Manufacture have been supplied to the following Local Authorities and Gas-Works:—

KILDWICK.
KILRUSH.
KIRKBURTON.
KNUTSFORD.
LEEK.
LEVEN, N.B.
LIMERICK.
LONDON COUNTY COUNCIL.
LYMINGTON.
MERTHYR TYDVIL.
MILBORNE PORT.
NORTH MIDDLESEX.
PEMBROKE.
PORTADOWN.
PORTRUSH.
PORTSMOUTH.
RAUNDS.
ROCHESTER.
SEAHAM HARBOUR.
SHIPSTON-ON-STOUR.
STAFFORD.
STAMFORD.
STROUD.
SUDBURY.
SWINTON.
UTTOXETER.
VENTNOR.
WARWICK.
WEXFORD.
WIGSTON.
WITNEY.
WOLVERHAMPTON.
WORKINGTON.

CROSBIE'S PAINTS.

GUARANTEED GENUINE AND FREE FROM ADULTERATION.

GUARANTEED GENUINE AND FREE FROM ADULTERATION.

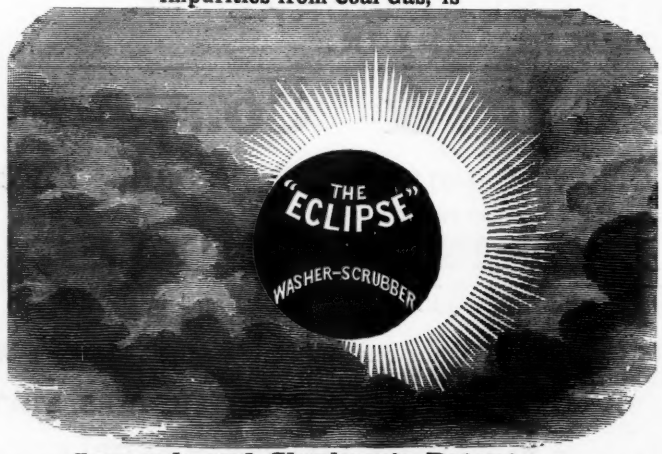
CATALOGUE AND TESTIMONIALS ON APPLICATION.

ADOLPHE CROSBIE, LTD.,

Colour Works, WOLVERHAMPTON.

CLAPHAM BROTHERS, KEIGHLEY. ESTABLISHED 1837.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas, is



WELLINGTON, NELSON, & MARKET ST. WORKS.

Telephone No. 2235.

Telegraphic Address: "CLAPHAM BROTHERS Keighley."

Laycock and Clapham's Patent.

55 "Eclipse" Washer-Scrubbers, varying in capacity from 50,000 to 4,000,000 cubic feet per day, passing a total of 54,450,000 cubic feet of Gas per day, have been erected.

The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

REPAIRS AND TROUBLE REDUCED TO A MINIMUM.

"YOU DON'T SAY SO!"

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 11, 1892.